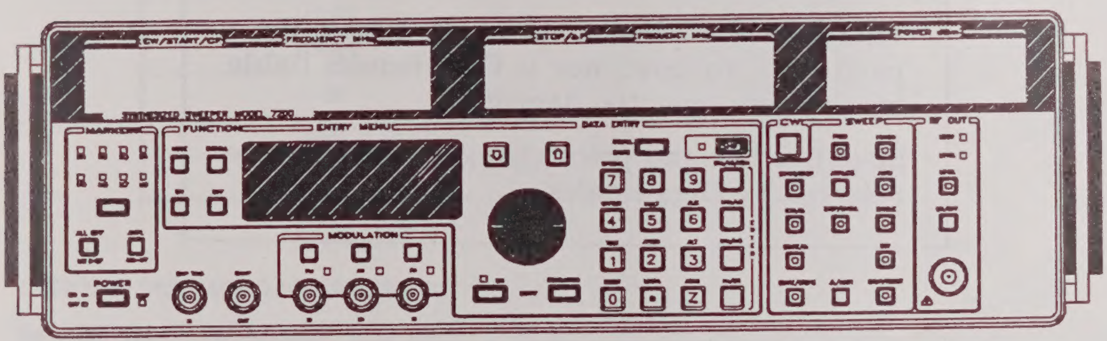
Gigatronics
MD#7200

**Giga-tronics**

# OPERATION & MAINTENANCE MANUAL

# MODEL 7200

## *Synthesized Microwave Sweeper*


FUNCTION
ENTRY MENU
DATA ENTRY
MODULATION
POWER
CW
SWEEP
RF OUT
7
8
9
4
5
6
1
2
3
0

## *Volume 1 of 2*

**Manual Part Number: 120AM00300**
**Print Date: August, 1993**

For information regarding instrument configurations and part numbers, see page iii.

### Serial Numbers

The instrument has a 6-digit serial number, which appears on a sticker on the rear panel. This manual applies to all serial numbers listed in Manual Changes (Chapter 10).

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GIGA-TRONICS, INC. ⬩ 2495 ESTAND WAY ⬩ P.O. BOX 232015 ⬩ PLEASANT HILL, CALIFORNIA 94523-6015 ⬩ PHONE (510) 680-8160 ⬩ FAX (510) 680-7736

## WARRANTY

Giga-tronics Model 7200 instruments are warranted against defective materials and workmanship for three years from date of shipment. Giga-tronics will at its option repair or replace products that are proven defective during the warranty period.

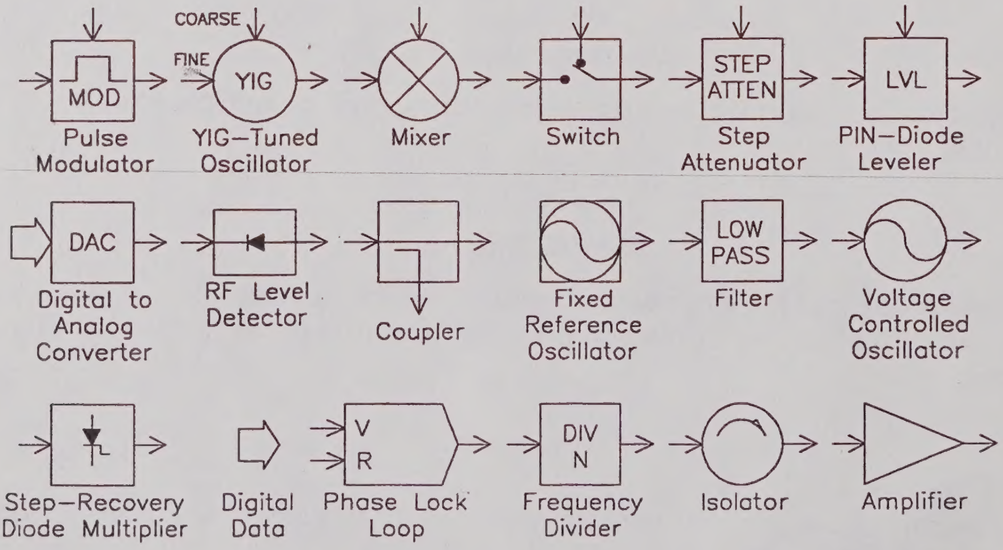
This warranty DOES NOT cover damage resulting from improper use, nor workmanship other than Giga-tronics service.

There is no implied warranty of fitness for a particular purpose, nor is Giga-tronics liable for any consequential damages.

Specification and price change privileges are reserved by Giga-tronics.

## SYMBOLS

Block diagram symbols frequently used in the manual are illustrated below.


MOD
Pulse Modulator
COARSE
FINE
YIG
YIG–Tuned Oscillator
Mixer
Switch
STEP ATTEN
Step Attenuator
LVL
PIN–Diode Leveler
DAC
Digital to Analog Converter
RF Level Detector
Coupler
Fixed Reference Oscillator
LOW PASS
Filter
Voltage Controlled Oscillator
Step–Recovery Diode Multiplier
Digital Data
V
R
Phase Lock Loop
DIV
N
Frequency Divider
Isolator
Amplifier

*PART NUMBERS*

This operation and maintenance manual is valid for all Model 7200 instruments. The instruments in the series differ primarily in their frequency ranges, which are indicated by a suffix in the model number. Each instrument contains a frequency assembly appropriate to its range. The parts structure for this series is as follows:

120DA00801 is the Basic Unit part number for the 7000 product line, and includes all circuit boards and chassis assemblies common to the product line.

120DA00302 is the part number for the 7200 series, and includes all circuit boards and chassis assemblies which are common to the 7200 series but not included under the Basic Unit part number.

There are six frequency assembly part numbers for the 7200 series, one for each of the available frequency ranges. Each frequency assembly includes circuit boards and chassis assemblies common to its frequency range:

| Range | Frequency Assembly Part# |
|---|---|
| .01-20 | 120DA00631 |
| .01-26 | 120DA00611 |
| .01-40 | 120DA00651 |
| 2-26 | 120DA00621 |
| 2-20 | 120DA00603 |
| 2-40 | 120DA00641 |

*OPTIONS, SPECIAL CONFIGURATIONS, MODIFICATIONS*

Examine the Model/Serial/Config. sticker affixed to the rear panel of the instrument. If the "Config." line is blank, there are no options installed in the instrument. If the line contains one or more two digit numbers (e.g., '06'), the standard options corresponding to those numbers are installed. Information concerning them will be found in Section 8 of this manual.

If the "Config." line of the Model/Serial/Config. sticker contains a three digit number (e.g., '221'), there is a combination of options and/or special modifications installed in the instrument. Information concerning them will be found in Section 9 of this manual.

*SERIAL NUMBERS*

This instrument has a six-digit serial number. The first digit is a prefix indicating instrument type (the 7000 product line is indicated by the prefix '7'). The last five digits of the serial number are a sequential suffix.

*MANUAL CHANGES*

Differences may exist between the manual and the instrument for which it is supplied, due to errors or circuit changes. These differences are described in Section 10 of this manual, with reference to individual instruments by serial number.

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# 1 Introduction & Performance Specifications

## 1.1 GENERAL INFORMATION

This Operation and Maintenance Manual covers all aspects of the Giga-tronics Model 7200 synthesized microwave sweeper. The information required to operate, calibrate and maintain the instrument is provided.

Volume 1 of the manual is divided into the following sections:

**Section 1** -- INTRODUCTION & PERFORMANCE SPECIFICATIONS -- This section contains a brief introduction to the instrument as well as the instrument's performance parameters.

**Section 2** -- OPERATIONAL INFORMATION -- A user's guide to the instrument and its controls.

**Section 3** -- THEORY OF OPERATION -- A description of the instrument's design and internal functioning, to the block diagram level.

**Section 4** -- CALIBRATION AND TESTING -- Procedures for inspection, calibration and performance testing.

**Section 5** -- MAINTENANCE -- Procedures for maintenance and troubleshooting.

**Section 6** -- PARTS LISTS -- Parts lists for all circuit boards and other assemblies.

Volume 2 of the manual is divided into the following sections:

**Section 7** -- DIAGRAMS -- Component diagrams and schematic diagrams for all circuit boards and other assemblies.

**Section 8** -- OPTIONS -- Descriptions of the available options for this instrument.

**Section 9** -- SPECIAL CONFIGURATIONS -- A description of any special modifications to the instrument with which this manual is supplied.

**Section 10** -- MANUAL CHANGES -- Errata information, and notices of changes made to the instrument after the printing of the manual.

## 1.2 INTRODUCTION

### 1.2.1 Purpose and Function

The purpose and function of Model 7200 instruments is to provide sweep capability over a range of synthesized microwave frequencies, and over a range of power levels, and in a variety of modulation modes.

### 1.2.2 Capabilities

Model 7200 is capable of generating output signals over the frequency range of 10 MHz to 40 GHz, at output power levels of up to +10 dBm. The output frequency can be fixed, swept, or frequency modulated. The output power can be fixed, swept, or amplitude or pulse modulated.

### 1.2.3 Performance Characteristics

Model 7200 generates its output signals under manual control from the front panel, or under remote computer control via the IEEE-488 General Purpose Interface Bus. Complete performance specifications are described later in this section.

### 1.2.4 Weight and Dimensions

Model 7200 has a nominal weight of 65 lbs; the dimensions are 5.25 inches (height) by 16.75 inches (width) by 24 inches (depth).

### 1.2.5 Power Requirements

100/120/220/240 VAC ±10%, 50-400 Hz, 250 W (nominal)

### 1.2.6 Environmental Requirements

Model 7200 is type tested to MIL-T-28800D, Type III, Class 5, Style E, Color R, except as follows:

Operating temperature range is 0 to 50° Celsius.

Warm-up time is 20 minutes.

### 1.2.7 Items Furnished

In addition to options and/or accessories specifically ordered, items furnished with the instrument are as follows:

1 ea. - Operation and Maintenance Manual, Volumes 1 and 2

1 ea. - 6 ft. power cord

2 ea. - PC Extender Board

1 ea. - PC Card Extractor

1 set. - Test Data

### 1.2.8 Items Required

An IEEE-488 interface cable is needed for remote control operation. Appropriate RF output cabling, which is made to fit the female type SMA output connector, can be ordered in the form of an Accessory A001 cable kit.

### 1.2.9 Tools and Test Equipment

Special tools are not required to operate Model 7200. Signal sources used for external modulation should meet the parameters set out in the performance specifications described later in this section. Test equipment required for calibration or performance verification is described in Section 4.

### 1.2.10 Storage

Storage of the instrument should be limited to an environment that does not exceed the temperature range of -40° Celsius to +70° Celsius.

### 1.2.11 Cooling

A cooling fan is installed in the instrument. The cooling air intake and exhaust are both located on the instrument's rear panel. Care must be taken to avoid obstructing the flow of air into and out of the instrument.

### 1.2.12 Cleaning

The air inlet screen should be cleaned whenever a significant amount of dirt or dust has accumulated. Whenever the instrument covers are removed, the interior should be blown out with dry air at a low velocity. The exterior of the instrument, including the front panel, may be cleaned with any commercial glass cleaner. The top and bottom covers may be cleaned with alcohol if necessary, but the front panel should not be exposed to alcohol or other solvents.

### 1.2.13 Installation and Preparation for Use

The instrument is shipped in operational condition and no special installation procedures are required. A warm-up time of 20 minutes is recommended.

### 1.2.14 Receiving Inspection

When the instrument is received, check the carton for evidence of damage. If damage is found, notify the carrier immediately, and open the carton only in the carrier's presence.

Use care in removing the instrument from the carton and check immediately for evidence of shipping damage: loose or broken control knobs, bent or broken connectors, dents or scratches on the panels, etc.

Each Giga-tronics instrument must pass rigorous inspections and tests prior to shipment. Upon receipt, it should immediately be subjected to a performance check to insure that its operation has not been impaired during shipment. The performance verification procedure is described in Chapter 4 of this manual.

### 1.2.15 Preparation for Reshipment

To protect the instrument during reshipment, use the best packaging materials available. If possible, re-use the original shipping container. If this is not possible, a strong carton (350 lbs./sq.in. bursting strength) or a wooden box should be used.

Wrap the instrument in heavy paper or plastic before placing it in the shipping container. Completely fill the areas on all sides of the instrument with packaging material, taking extra precautions to protect the front and rear panels.

Seal the package with strong tape or metal bands. Mark the outside of the package "FRAGILE -- DELICATE INSTRUMENT".

If corresponding with the factory or the local Giga-tronics sales office regarding reshipment, please reference the full model number and serial number. If the instrument is being reshipped for repair, be sure to enclose all available pertinent data regarding the problem that has been found.

## 1.2.16 Safety Precautions

### CAUTION

The instrument can be damaged if operated with the line voltage selector set inappropriately for the applied line voltage. Before operating the instrument, make sure that the instrument power requirements are compatible with the power source to be used. The instrument has been designed for international use over a broad range of voltages: 100, 120, 220, or 240, ±10%, at 50-400 Hz. Model 7200 uses an internationally approved connector that includes voltage selection, fuse and filter for RFI protection.

### WARNING

The instrument has a 3-wire power cord with a 3-terminal polarized plug for connection to the power source and safety-ground. The ground, or safety ground, is connected directly to the chassis; therefore, if a 3-to-2 wire adapter is used, be sure to connect the ground lead from the adapter to earth ground. Failure to do this could cause the instrument to float above earth ground, posing a shock hazard.

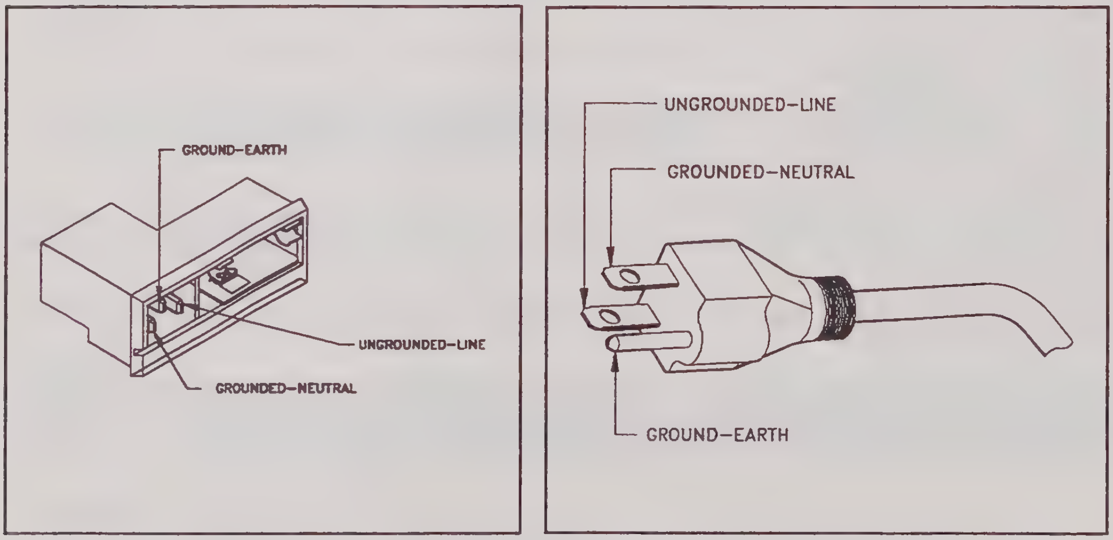


*Figure 1.1: Power line connection*

### *1.2.17* Voltage Selection

To select the correct operating line voltage, proceed as follows:

- Open the cover door and rotate the fuse-pull to the left; remove the fuse.
- Select the operating voltage by orienting the PC board in order to position the desired voltage label on the top left side. Push the board firmly into the module slot.
- Rotate the fuse-pull back into the normal position and reinsert the fuse into the holder, using care to select the correct fuse value.

### *1.2.18* Fuse Selection

When the instrument is shipped from the factory, it is set for a particular power line voltage (normally 120V for domestic shipping destinations). The power line fuse for this setting is a 4.0A 4AG Slo-Blo. If the instrument is set to operate on a 240V power line, the fuse must be changed to a 2A 3AG Slo-Blo.

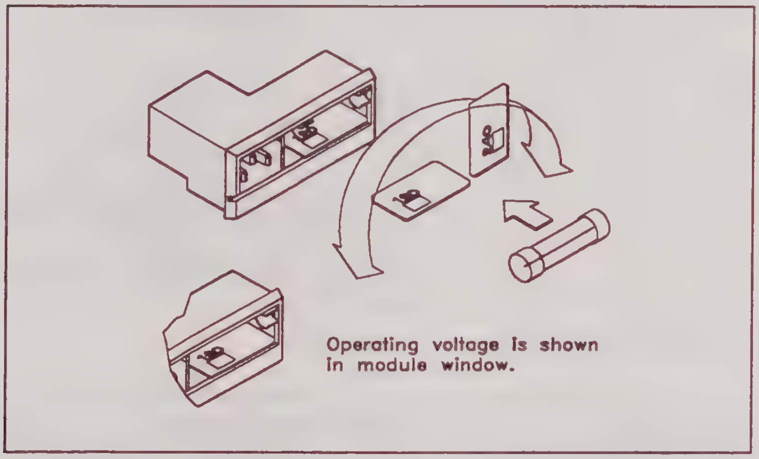


*Figure 1.2: Voltage selector/fuse holder*

## 1.3 PERFORMANCE SPECIFICATIONS

### 1.3.1 CW Operation

| | |
|---|---|
| RANGES: | .01 to 20 GHz, .01 to 26.5 GHz, .01 to 40 GHz, 2 to 20 GHz, 2 to 26.5 GHz, or 2 to 40 GHz (consult instrument's serial number tag). |
| RESOLUTION: | 1 Hz (2 Hz above 20 GHz in instruments to 40 GHz). |
| ACCURACY AND STABILITY: | Identical to time base oscillator. |
| TIME BASE (internal): | 10 MHz |
| AGING RATE: | $<1 \times 10^{-9}$/day after 72 hours continuous operation. |
| TEMPERATURE STABILITY: | $< \pm 2 \times 10^{-10}/^{\circ}\mathrm{C}$ (0 to +50°C) |
| TIME BASE (external): | 10 MHz $\pm 1 \times 10^{-6}$ or better (Option 11 provides for 5 MHz external time base.) |
| SWITCHING TIME: | <50 ms (20 ms, typical) to within specified frequency accuracy. |

### 1.3.2 Spectral Purity

| | |
|---|---|
| HARMONICS (up to max. frequency and max. leveled power): | <-55 dBc, 0.05 to 40 GHz;<br><-25 dBc, 0.01 to 0.05 GHz (<-20 dBc .01 to .05 GHz, in instruments to 40 GHz). |
| SUB-HARMONICS: | None in instruments to 20 or 26.5 GHz (<-55 dBc above 20 GHz in instruments to 40 GHz). |
| NON-HARMONICS: | <-55 dBc (<-49 dBc above 20 GHz in instruments to 40 GHz. |

POWER LINE/FAN ROTATION RELATED (dBc, CW mode):

| Frequency Range (GHz) | Offset from Carrier | | |
|---|---|---|---|
| | <300 Hz | 300 Hz to 1 kHz | >1 kHz |
| .01 to < 2 | -45 | -55 | -55 |
| 2 to < 8 | -50 | -55 | -55 |
| 8 to <20 | -45 | -55 | -55 |
| 20 to 26.5 (26.5 GHz units) | -40 | -50 | -55 |
| 20 to 40 (40 GHz units) | -39 | -49 | -49 |

SINGLE-SIDEBAND PHASE NOISE (dBc/Hz noise bandwidth, CW mode, all power levels):

| Frequency Range (GHz) | Offset from Carrier | | | | |
|---|---|---|---|---|---|
| | 30 Hz | 100 Hz | 1 kHz | 10 kHz | 100 kHz |
| .01 to <2 | -60 | -75 | -80 | -75 | -100 |
| 2 to <8 | -65 | -75 | -80 | -80 | -105 |
| 8 to <20 | -60 | -65 | -75 | -75 | -100 |
| 20 to 26.5 (26.5 GHz units) | -55 | -65 | -70 | -70 | - 95 |
| 20 to 40 (40 GHz units) | -54 | -59 | -69 | -69 | -94 |

RESIDUAL FM (Hz, RMS; CW mode):

| Frequency Range (GHz) | Post-detection Bandwidth | |
|---|---|---|
| | .3 to 3 kHz | .05 to 15 kHz |
| .01 to <2 | 30 | 200 |
| 2 to <8 | 20 | 150 |
| 8 to <20 | 40 | 300 |
| 20 to 26.5 (26.5 GHz units) | 60 | 450 |
| 20 to 40 (40 GHz units) | 80 | 600 |

### *1.3.3* RF Output Power

| | |
|---|---|
| MAXIMUM LEVELED OUTPUT: | >+10 dBm (instruments to 26.5 GHz).<br>For instruments to 40 GHz:<br>>+10 dBm, 10 MHz to <18 GHz,<br>>+8 dBm, 18 to <20 GHz,<br>>+5 dBm, 20 to <35 GHz,<br>>+2 dBm, >35 to 40 GHz. |
| INCREMENTAL LEVEL RANGE: | -20 to +15 dBm |
| RESOLUTION: | 0.01 dB, entry and display to -99.99 dBm (display is 0.1 dB at <-100.0 dBm). |
| MINIMUM OUTPUT LEVEL: | -130 dBm (-110 dBm, instruments to 26.5 or 40 GHz). |
| RF OFF: | Typically attenuates a 0 dBm signal to <-140 dBm at the output connector. |
| OUTPUT ACCURACY (internally leveled, CW or frequency sweep mode, AM off): | ±1 dB to 20 GHz, ±2 dB to 40 GHz (±0.1 dB per attenuation step); ±2 dB from 10 to 20 MHz in instruments to 40 GHz. |

| | |
|---|---|
| OUTPUT FLATNESS: | Included in accuracy. |
| OUTPUT SWITCHING TIME: | Typically <1 ms (20 ms with attenuator change). |
| OUTPUT IMPEDANCE: | 50 Ω, nominal |
| OUTPUT SWR: | <2:1 |
| EXTERNAL LEVELING: | Output power may be externally leveled by positive or negative ZBS detectors or power meters. |

### *1.3.4* Analog Frequency Sweep

Continuous sweep, generated within the instrument, which is phase-lock corrected at start and band crossing frequencies; may be operated simultaneously with digital or analog power sweep.

| | |
|---|---|
| RANGE: | From FA (minimum frequency of instrument) to FB (maximum frequency of instrument). |
| SWEEP TIME (any sweep mode): | 2 ms to 200 s in five ranges. Minimum sweep time is determined by the sweep width and the maximum sweep speed. |

| Range | Resolution |
|---|---|
| 2 ms to 20 ms | 10 µs |
| 20 ms to 200 ms | 100 µs |
| 200 ms to 2 s | 1 ms |
| 2 s to 20 s | 10 ms |
| 20 s to 200 s | 100 ms |

| | |
|---|---|
| MINIMUM SWEEP WIDTH: | 1 MHz |
| MAXIMUM SWEEP SPEED: | 600 MHz/ms |
| BAND CROSSING DEAD TIME (at 2, 8, 20, & 28 GHz): | 50 ms, nominal |
| SWEEP WIDTH RESOLUTION (any sweep mode): | 0.1% of sweep width (0.2% of sweep width above 20 GHz in instruments to 40 GHz). |
| START FREQUENCY ACCURACY (any sweep mode): | ± 0.5 MHz, in instruments to 20 or 26.5 GHz (± 1 MHz above 20 GHz in instruments to 40 GHz). |
| SWEEP LINEARITY (relative to a linear RAMP OUT voltage, sweep time ≥100 ms, any sweep mode): | ±1% of sweep width or ±50 MHz, whichever is less (±2% of sweep width or ±100 MHz, whichever is less, in instruments to 40 GHz). |

### *1.3.5* Analog Sweep Modes

| | |
|---|---|
| START/STOP ($FA \le [F1 \ne F2] \le FB$): | Sweeps up or down from a preset start frequency (F1) to a preset stop frequency (F2). |
| START/$\Delta$ ($FA \le [F1 \pm \Delta F] \le FB$): | Sweeps up or down from a preset start frequency (F1) through a preset sweep width ($\Delta F$). |
| CTR/$\Delta$ ($FA \le [CF \pm (\Delta F/2)] \le FB$): | Sweeps up or down through a preset sweep width ($\Delta F$) centered symmetrically about a preset center frequency (CF). |
| $\Delta$ MKR ($FA \le [Mx \ne My] \le FB$): | Sweeps up or down from any preset marker (Mx) to any other preset marker (My). |

### *1.3.6* Analog Sweep Functions

| | |
|---|---|
| AUTO: | Continuous cycle of the preset sweep. |
| SINGLE: | A single cycle of the preset sweep, initiated by manual operation of the front panel pushbutton. |
| EXT: | A single cycle of the preset sweep, initiated by a trigger input from an external source. |
| STOP/RESET: | Stops the sweep when activated by the front panel pushbutton, to permit manual tuning of the frequency at any point in the sweep. Pressing the pushbutton a second time resets the sweep to the initial conditions. |

### *1.3.7* Analog Sweep Frequency Markers

Eight intensity or amplitude markers, individually selectable from the front panel or via the GPIB.

| | |
|---|---|
| RESOLUTION: | Sweep width ÷ 4,000 |
| ACCURACY: | Same as sweep linearity except marker may vary ±25 mV relative to the linear 0 to +10V RAMP OUT. |
| AMPLITUDE MARKERS: | Approximately -3 dB change in RF output power during analog frequency sweep markers. |

### *1.3.8* Digital (Step/Dwell) Frequency Sweep

| | |
|---|---|
| RANGE: | FA (minimum frequency of instrument) to FB (maximum frequency of instrument). |
| STEP SIZE: | Any increment within the instrument's frequency resolution. |
| DWELL TIME: | May be set in 10 ms increments from approximately 10 ms to 200 s. |
| ACCURACY AND STABILITY: | Same as in CW when locked at each step during dwell time. |

### *1.3.9* Digital Sweep Modes

| | |
|---|---|
| START/STOP ($FA \le [F1 \ne F2] \le FB$): | Sweeps up or down from a preset start frequency (F1) to a preset stop frequency (F2). |
| START/Δ ($FA \le [F1 \pm \Delta F] \le FB$): | Sweeps up or down from a preset start frequency (F1) through a preset sweep width (ΔF). |
| CTR/Δ ($FA \le [CF \pm (\Delta F/2)] \le FB$): | Sweeps up or down through a preset sweep width (ΔF) centered symmetrically about a preset center frequency (CF). |
| START/STEPS ($FA \le [F1 \pm (\text{step size} \times \text{no. of steps})] \le FB$): | Sweeps up or down from a preset start frequency (F1) through a preset number of frequency steps. |

### *1.3.10* Digital Sweep Functions

| | |
|---|---|
| AUTO: | Continuous cycle of the preset sweep. |
| SINGLE: | A single cycle of the preset sweep or (with stop activated) a single preset step, initiated by manual operation of the front panel pushbutton. |
| EXT: | A single cycle of the preset sweep or (with stop activated) a single preset step, initiated by a trigger input from an external source. |
| STOP/RESET: | Stops the sweep when activated by the front panel pushbutton, to permit manual tuning of the frequency at any point in the sweep. Pressing the pushbutton a second time resets the sweep to the initial conditions. |

### *1.3.11* Analog Power Sweep

Continuous sweep, generated within the instrument. May be operated simultaneously with analog or digital frequency sweep.

| | |
|---|---|
| RANGE: | 20 dB maximum, up or down, within incremental level range (maximum output power to -20 dBm, minus attenuator setting). |
| SWEEP TIME (any sweep mode): | 2 ms to 200 s in five ranges. Minimum sweep time is determined by the sweep width and the maximum sweep speed. |

| Range | Resolution |
|---|---|
| 2 ms to 20 ms | 10 µs |
| 20 ms to 200 ms | 100 µs |
| 200 ms to 2 s | 1 ms |
| 2 s to 20 s | 10 ms |
| 20 s to 200 s | 100 ms |

| | |
|---|---|
| MINIMUM SWEEP WIDTH: | 0.01 dB |
| MAXIMUM SWEEP SPEED: | 1 dB/ms |

| | |
|---|---|
| SWEEP LEVEL RESOLUTION (any sweep mode): | 0.01 dB |
| START LEVEL ACCURACY (any sweep mode): | ±0.5 dB |
| SWEEP LEVEL LINEARITY (any sweep mode): | ±5% of sweep width |

### 1.3.12 Analog Power Sweep Modes

| | |
|---|---|
| START/STOP ($LA \leq [L1 \neq L2] \leq LB$): | Sweeps up or down from a preset start level (L1) to a preset stop level (L2). |
| START/Δ ($LA \leq [L1 \pm \Delta L] \leq LB$): | Sweeps up or down from a preset start level (L1) through a preset sweep width ($\Delta L$). |
| CTR/Δ ($LA \leq [CL \pm (\Delta L/2)] \leq LB$): | Sweeps up or down through a preset sweep width ($\Delta L$) centered symmetrically about a preset center level (CL). |

### 1.3.13 Analog Power Sweep Functions

| | |
|---|---|
| AUTO: | Continuous cycle of the preset sweep. |
| SINGLE: | A single cycle of the preset sweep, initiated by manual operation of the front panel pushbutton. |
| EXT: | A single cycle of the preset sweep, initiated by a trigger input from an external source. |
| STOP/RESET: | Stops the sweep when activated by the front panel pushbutton, to permit manual adjustment of the level at any point in the sweep. Pressing the pushbutton a second time resets the sweep to the initial conditions. |

### 1.3.14 Digital (Step/Dwell) Power Sweep

| | |
|---|---|
| RANGE: | LA (minimum level of instrument) to LB (maximum level of instrument). |
| STEP SIZE: | Any multiple of 0.01 dB up to maximum sweep range. |
| DWELL TIME: | May be set in 10 ms increments from approximately 10 ms to 200 s. |
| ACCURACY & STABILITY: | Same as in CW when leveled at each step during dwell time. |

### 1.3.15 Digital Power Sweep Modes

| | |
|---|---|
| START/STOP ($LA \leq [L1 \neq L2] \leq LB$): | Sweeps up or down from a preset start level (L1) to a preset stop level (L2). |
| START/Δ ($LA \leq [L1 \pm \Delta L] \leq LB$): | Sweeps up or down from a preset start level (L1) through a preset sweep width ($\Delta L$). |
| CTR/Δ ($LA \leq [CL \pm (\Delta L/2)] \leq LB$): | Sweeps up or down through a preset sweep width ($\Delta L$) centered symmetrically about a preset center level (CL). |

| | |
|---|---|
| START/STEPS<br>($LA \le [L1 \pm(\text{step size} \times \text{no. of steps})] \le LB$): | Sweeps up or down from a preset start level (L1) through a preset number of level steps. |
| EXT STEP: | A single step of a preset sweep initiated by a trigger input from an external source. |

### 1.3.16 Digital Power Sweep Functions

| | |
|---|---|
| AUTO: | Continuous cycle of the preset sweep. |
| SINGLE: | A single cycle of the preset sweep or (with stop activated) a single preset step, initiated by manual operation of the front panel pushbutton. |
| EXT: | A single cycle of the preset sweep or (with stop activated) a single preset step, initiated by a trigger input from an external source. |
| STOP/RESET: | Stops the sweep when activated by the front panel pushbutton, to permit manual adjustment of the level at any point in the sweep. Pressing the pushbutton a second time resets the sweep to the initial conditions. |

### 1.3.17 PM Envelope Parameters

Pulse/Square Wave Modulation (PM) specifications apply with AM and FM off. PM may be operated with FM.

| | |
|---|---|
| ON/OFF RATIO: | >80 dB |
| RISE/FALL TIMES: | <10 ns |
| OVERSHOOT, UNDERSHOOT & RINGING: | ±2 dB, maximum |
| SETTLING TIME (to within 1 dB): | <100 ns |
| LEVELED PULSED OUTPUT POWER (referenced to leveled CW output power): | ±0.5 dB, typical (≥ 100 ns pulse width);<br>± 1 dB typical (< 100 ns pulse width). |

### 1.3.18 Internally Generated PM Repetition Rate

REPETITION RATE:

| Range | Resolution |
|---|---|
| 5 Hz to 100 Hz | 0.1 Hz |
| 100 Hz to 1 kHz | 1 Hz |
| 1 kHz to 10 kHz | 10 Hz |
| 10 kHz to 100 kHz | 100 Hz |
| 100 kHz to 1 MHz | 1 kHz |

ACCURACY: ±0.02% of range maximum value.

JITTER: Same as instrument time base.

### *1.3.19* Internally Generated PM Delay (referenced to Sync Output)

RANGE: 0 to 2 s

RESOLUTION: 10 ns

ACCURACY: ±1% of setting or 20 ns, whichever is greater.

JITTER: 0.01% of setting or 100 ps, whichever is greater.

### *1.3.20* Internally Generated PM Width

RANGE: 50 ns to 2 s

RESOLUTION: 10 ns

ACCURACY: ±1% of setting or 20 ns, whichever is greater.

JITTER: 0.01% of setting or 100 ps, whichever is greater.

### *1.3.21* Externally Triggered PM Envelope (one envelope produced by each trigger supplied)

REPETITION RATE: 5 Hz to 5 MHz

PULSE DELAY: Set by internal delay control.

PULSE WIDTH: Set by internal width control.

INPUT TRIGGER REQUIRED: Positive or negative-going TTL level trigger pulse, >25 ns wide.

### *1.3.22* Externally Generated PM Envelope (one envelope produced by each pulse supplied)

REPETITION RATE: 5 Hz to 5 MHz, leveled output; DC to 10 MHz, unleveled output.

PULSE DELAY (output envelope leading edge referenced to input pulse leading edge): 50 ns, typical

INPUT PULSE REQUIRED: Positive or negative-going TTL level pulse, ≥50 ns wide (leveled output); ≥20 ns wide (unleveled output).

### *1.3.23* AM Envelope Parameters

Amplitude Modulation (AM) specifications apply for waveforms whose envelope peak is at least 1 dB below maximum specified output power when the instrument is internally leveled, FM and PM off. AM may be operated simultaneously with FM.

| | |
|---|---|
| DEPTH RANGE: | 0 to 90% |
| DEPTH RESOLUTION: | 0.1% increments |
| DEPTH ACCURACY: | ±5% |
| BANDWIDTH (30% depth): | DC coupled, 3 dB points >50 kHz. |
| FREQUENCY RESPONSE (flatness relative to 1 kHz rate at 30% depth): | ±0.2 dB, DC to 10 kHz. |
| HARMONIC DISTORTION (relative to externally supplied AM envelope): | 2% (1% typical), at ≤50% depth, ≤1 kHz rate;<br>10%, at ≤50% depth, ≤50 kHz rate. |
| INCIDENTAL PHASE MODULATION (rates <10 kHz, 30% depth, 50 Hz to 15 kHz measurement bandwidth): | <0.2 radians, peak, typical |
| INCIDENTAL FM: | Incidental Phase Modulation × AM rate |

### *1.3.24* AM Indicator

| | |
|---|---|
| READOUT: | 3 digits |
| RESOLUTION: | 0.1% |
| ACCURACY: | ±5% |

### *1.3.25* Internally Generated AM Envelope

| | |
|---|---|
| WAVEFORM: | Sine, square, or triangle wave. |
| RATE: | 1 Hz to 100 kHz |
| RESOLUTION: | 1 Hz |
| ACCURACY: | ± 0.01 Hz |

### *1.3.26* Externally Supplied AM Envelope

| | |
|---|---|
| WAVEFORM: | Any waveform compatible with bandwidth considerations. |
| RATE: | DC to 100 kHz |
| SENSITIVITY: | 1 Vp, for 100% depth. |
| INPUT IMPEDANCE: | 600 Ω, nominal |

### 1.3.27 FM Envelope Parameters

Frequency Modulation (FM) specifications apply with AM and PM off. FM may be operated simultaneously with AM or PM.

| | |
|---|---|
| MAX DEVIATION (WIDE MODE): | 10 MHz, peak (20 MHz, peak, above 20 GHz in instruments to 40 GHz). |
| FLATNESS: | ±1 dB for rates from 10 Hz to 1 MHz;<br>±3 dB from 1 to 5 MHz |
| RESIDUAL FM (50 Hz to 15 kHz post-detection bandwidth): | <3 kHz rms typical (<6 kHz rms typical, above 20 GHz in instruments to 40 GHz). |
| MAX DEVIATION (narrow mode): | The lesser of 100 × Fmod or 10 MHz, peak (200 × Fmod or 20 MHz, peak, above 20 GHz, in instruments to 40 GHz). |
| FLATNESS: | ±1 dB for rates from 20 kHz to 1 MHz;<br>±3 dB from 1 to 5 MHz. |
| RESIDUAL FM: | Same as CW |
| DISTORTION: | <5% |
| INCIDENTAL AM: | <±0.2% ÷ MHz of deviation |

### 1.3.28 FM Indicator

| | |
|---|---|
| READOUT: | 3 digits |
| RESOLUTION: | 10 kHz |
| ACCURACY: | ±5% |

### 1.3.29 Internally Generated FM Envelope

| | |
|---|---|
| WAVEFORM: | Sine, square, or triangle wave. |
| RATE: | 10 Hz to 1 MHz |
| RESOLUTION: | 1 Hz |
| ACCURACY: | ±0.01 Hz |

### 1.3.30 Externally Supplied FM Envelope

| | |
|---|---|
| WAVEFORM: | Any waveform compatible with bandwidth considerations. |
| RATE: | 10 Hz to 5 MHz |
| SENSITIVITY: | 1 V, peak, for maximum deviation |
| INPUT IMPEDANCE: | 50 Ω, nominal |

### *1.3.31* Program Store/Recall

Ten complete front panel set-ups of frequency, frequency sweep, output level, power sweep, PM, AM, and FM may be stored in the instrument's non-volatile memory for future recall.

### *1.3.32* Special Functions

Special functions are accessible via the data entry keyboard.

| | |
|---|---|
| ADRS: | Allows setting of the instrument's IEEE-488 bus address via the data entry keyboard and displays it at the entry menu. |
| LOCAL: | Returns control of all parameters to the instrument's front panel. |
| RESET: | Initializes all parameters. |
| ALT: | Alternates between any two or more stored sweeps. |
| ATTEN: | Fixes the 10 dB step attenuator at a particular attenuation step; the RF output level may then be adjusted over a range extending from 20 dB below the attenuation value to 10 dB (15 dB, typ.) above the attenuation value; the power display shows actual output power. |
| TEST: | Initiates the instrument's self-test routines. |
| ALC: | Allows selection of a level control mode using an external detector or power meter, or 'unleveled' max. power mode. |
| MULT: | Allows division of the instrument's frequency by any integer to provide proper signals for external frequency multipliers. |
| OFFSET: | Allows frequency readout to be offset from the output frequency. |
| SPECIAL: | Allows user-defined and/or future special functions and features. |

### 1.3.33 Front Panel Inputs/Outputs

All connectors are type BNC unless otherwise stated.

| | |
|---|---|
| RF OUT: | The generator's RF output signal, on a type SMA connector (2.92 mm connector on instruments to 40 GHz). Option 22 relocates the connector to the rear panel. |
| SWP TRIG IN: | TTL level, ≥50 ns wide trigger intput to initiate a sweep or step. |
| RAMP OUT: | 0 to +10 V ramp out, proportional to frequency between set sweep limits. |
| AM IN: | Input signal for external amplitude modulation. |
| FM IN: | Input signal for external frequency modulation. |
| PM IN: | Input signal for external pulse modulation. |

### 1.3.34 Rear Panel Inputs/Outputs

All connectors are type BNC unless otherwise stated.

| | |
|---|---|
| ALC IN: | Input signal for remote leveling of output power by positive or negative polarity ZBS detectors or by applicable power meters.<br>Range: 500 µV to 2 V<br>Loop Bandwidth: 50 kHz, nominal (ZBS detector), 0.7 Hz, nominal (power meter).<br>Input Impedance: 10 kΩ, nominal |
| REF IN: | External time base input signal, 10 MHz $\pm 1 \times 10^{-6}$ or better, 0.5 to 5 Vpp, overrides internal time base.<br>Input Impedance: 100 Ω, nominal |
| REF OUT: | Buffered time base output, 10 MHz, 2 Vpp into 50 Ω, sine wave, derived from internal or external timebase. |
| 5-6 MHz IN: | 5-6 MHz input signal for controlling the frequency of the signal generator (permits fine frequency resolution control from an external synthesized source); 2 Vpp into 50 Ω. |
| STOP SWEEP IN/OUT: | TTL level signal, low input to stop frequency sweep or low output to indicate that sweep has been stopped. |
| LOCK/LEVEL OUT: | TTL high indicating that frequency is phase locked and output power is leveled. |
| PEN LIFT OUT: | TTL low during sweep, high during retrace. |
| PM VIDEO OUT: | TTL high level (approximately 1 V into 50 Ω) pulse modulation envelope waveform. |
| PM SYNC OUT: | TTL high level (approximately 1 V into 50 Ω) 50 ns wide trigger pulse output, coincident with the leading edge of the pulse modulation envelope waveform. |
| AM SIG OUT: | 2 Vpp amplitude modulation waveform output. |
| FM SIG OUT: | 2 Vpp frequency modulation waveform output. |

| | |
|---|---|
| BLANK/MKR OUT: | +5 V during band changes, filter changes, and retrace; 0 V during sweep; -5 V during markers. |
| NEG BLANK OUT: | 0 V during sweep, -5 V during band changes, filter changes, and retrace. |
| .5 V/GHz OUT: | Signal directly proportional to the output frequency (.25 V/GHz in instruments to 40 GHz) |

### *1.3.35* General Specifications

| | |
|---|---|
| REMOTE INTERFACE: | IEEE STD 488-1978 (all parameters except AC power on/off). |
| OPERATING TEMPERATURE: | 0 to 50°C. |
| ENVIRONMENTAL: | Complies with MIL-T-28800E, Type III, Class 5, Style E. |
| POWER: | 100/120/220/240 VAC ±10%, 50-400 Hz, 350 Watts, nominal. |

WEIGHT AND DIMENSIONS:

| ***Dimension*** | ***Net*** | ***Packed for air shipment*** |
|---|---|---|
| Width | 16.75 in (42.5 cm) | 24 in (60.9 cm) |
| Depth | 24 in (60.9 cm) | 31 in (76.7 cm) |
| Height | 5.25 in (13.3 cm) | 11.25 in (28.6 cm) |
| Volume | 1.22 $ft^3$ (.0345 $m^3$) | 4.84 $ft^3$ (.1372 $m^3$) |
| Weight | 65 lbs (29.6 kg) | 80 lbs (36.3 kg) |

# 2 *Operational Information*

## *2.1* THE FRONT PANEL

The front panel is designed to be both versatile and easy to use. Numerical data can be entered in any of three ways: by typing it on the numeric keypad, by dialing it on the digi-dial, or by incrementing it using the up/down keys. The 'ENTRY MENU' display prompts the user, and shows data as it is entered. Front panel settings are automatically saved in non-volatile memory when the instrument is powered off, and are restored when it is powered back on. As many as ten front panel setups can be saved in non-volatile memory for later retrieval.

At power-on, the entry menu displays the model and frequency range of the instrument (e.g., "MODEL 7200, 10 MHz  to 20.1 GHz"). The last functional settings made before power-off remain in effect. The instrument's default settings (minimum frequency, 0 dBm level, no sweep, no modulation) can be activated using the RESET function.

### *2.1.1* Function Selection

Instrument functions, such as 'CW', 'SWEEP/FREQ', and 'AM', are selected by pressing the corresponding buttons. The top line of the entry menu identifies any parameter (such as frequency or level) which needs to be specified for the selected function; the bottom line shows the current value of that parameter, which can be changed by the user by means of the keypad, digi-dial, or up-down keys.

For some functions, it is necessary to select subfunctions as well. For example, the 'PM' function requires the user to specify such parameters as rate, width, and delay. Subfunctions are selected by means of the **[MODE]** and **[SCROLL]** buttons. For examples, see the sections on modulation setup.

Some buttons in the SWEEP section (i.e., **[START/STOP]** control two parameters. In such cases, press the button repeatedly in order to toggle between the two parameters.

### *2.1.2* Numeric Entry

The value of a parameter may be entered in any of three ways. The first method is to key in the digits, using the numeric keypad. The digits appear in the bottom line of the entry menu. When all digits have been entered, press the appropriate 'units' key (on the right side of the keypad). This will set the parameter to the newly entered value. If you enter a value which exceeds the allowable range for that parameter, the instrument setting will default to the closest value that is within range. The [-/⇐] key (located below the [3] key) has a dual function. If it is pressed prior to any numeric key, a minus sign will precede the value entered. If it is pressed after one or more numeric keys, it functions as a backspace.

The second method of numeric entry uses the digi-dial (the black knob) to immediately change the value of the parameter displayed in the entry menu. Note: the value shown on the bottom line of the entry menu display changes, as the knob is turned, until the maximum or minimum value is reached. If necessary, the step resolution of the digi-dial may be changed as needed (see following sections.)

The third method of numeric entry is to increment or decrement the value by step using the up/down keys. This works in a manner similar to the digi-dial. Again, the resolution is programmable.

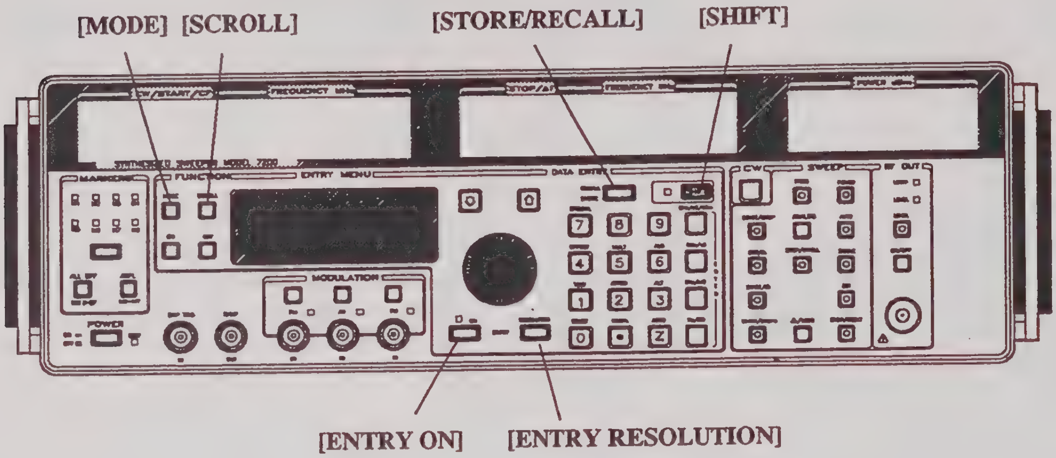


*Figure 2.1: Front panel operation*

### 2.1.3 Setting Resolution

The entry resolution of the digi-dial and the up/down keys is programmable, and is set for both at the same time. Entry resolution is limited only by the resolution of the instrument itself (e.g., for a 7200 with 1 Hz frequency resolution, entry resolution can range from 1 Hz to the maximum frequency). Entry resolution is set independently for different functions (it can be different for RF frequency and AM rate, for example).

To set the resolution for whichever parameter is displayed in the entry menu (top line), press **[RESOLUTION]** in the DATA ENTRY section. The entry menu upper line will now read ".... RESOLUTION." Enter the desired value of resolution with the numeric keypad and terminate with an appropriate units key. Resolution may also be stepped in increments of powers of ten with the up/down buttons (e.g., 2, 20, 200). When finished setting the resolution, press the key for the parameter, or a unit key, in order to return to the numeric entry mode.

### 2.1.4 Entry Disable

The digi-dial and up/down keys may be disabled to avoid accidental changes to parameters. The digi-dial and up/down keys are disabled by pressing the **[ENTRY ON]** key. When the LED above the **[ENTRY ON]** is out, the digi-dial and up/down keys are disabled.

### 2.1.5 Shifted Functions

A number of the keys in the DATA ENTRY section have an additional use when preceded by the **[SHIFT]** key. These additional uses are labeled in blue. When the **[SHIFT]** key is pressed, the LED to its left lights until the function key is pressed. See the section on shifted functions for details.

### 2.1.6 Store/Recall

Non-volatile memory is provided to allow storing of up to ten complete front panel setups. Once all the desired parameters have been set (or allowed to default), the settings may be stored. Settings are stored by first pressing **[SHIFT] [STORE]** and then the desired memory number (0 to 9); the data is stored immediately. To recall a particular setup, press **[RECALL]** followed by the memory number (0 to 9).

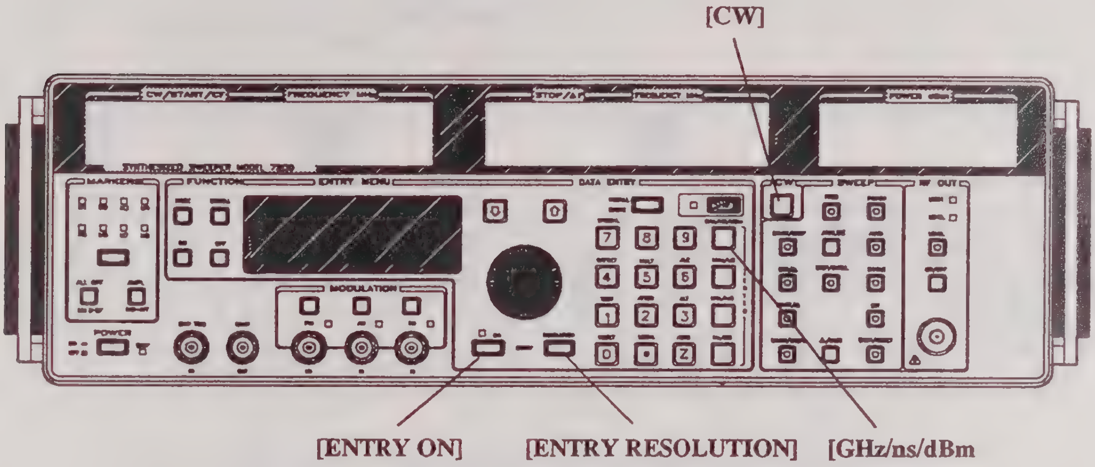


*Figure 2.2: CW frequencies*

## 2.2 CW FREQUENCIES

To set a desired single frequency output from the generator: press **[CW]** in the front panel's CW/SWEEP selection area, and then key in the desired frequency and frequency units in the DATA ENTRY selection area. The DATA ENTRY area contains both the numeric keypad and (immediately to the right) the frequency units keys in GHz, MHz, kHz and Hz.

For example, enter: **[CW] [2.468] [GHz]**

When you press **[CW]**, the LED in the CW key lights; the entry menu shows "CW FREQUENCY" with the value and units of the last CW frequency setting. The CW FREQUENCY readout displays the last set CW frequency; while the entry menu shows the new numbers in real-time, as they are keyed in. After the desired value (2.468) has been keyed in, press **[GHz]** to set the instrument's output and the frequency readout to the newly selected frequency.

In addition, fine adjustments of the frequency can be made at any time by activating the digi-dial and up/down key section of the DATA ENTRY selection area. In order to do so, press the [ENTRY ON] key (its LED will light to indicate that it is active). You may now change the frequency using the digi-dial or the up/down keys. If it is necessary to change the frequency step resolution of the digi-dial or the up/down keys, press **[ENTRY RESOLUTION]**. Then, use the up/down keys, or the numeric keypad and frequency units keys, to select the desired step resolution. The entry menu display will show "FREQUENCY RESOLUTION," while you are adjusting the resolution. After the resolution is set, press **[CW]** to adjust CW frequency again in the newly set resolution increments. When finished using the digi-dial and up/down keys, press **[ENTRY ON]** to disable their operation, so that erroneous information will not be entered if the dial or keys are touched accidentally.

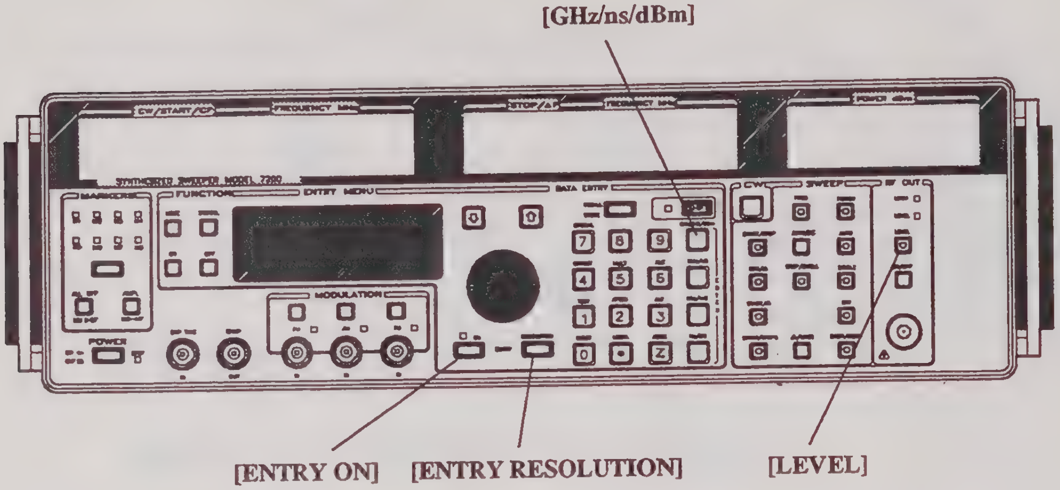


*Figure 2.3: RF level*

## 2.3 RF LEVEL

To set RF power from the signal generator, press **[LEVEL]** in the front panel's RF OUT selection area. Then, key in the desired power level and press the appropriate power units key (dBm) in the DATA ENTRY selection area. Note that the DATA ENTRY selection area contains both the numeric keypad and the power units key **[dBm]**, immediately to the right. If a negative value is desired, press the '-' key, first.

For example, enter: **[LEVEL] [-15.5] [dBm]**

When you press **[LEVEL]**, the entry menu shows "RF LEVEL" with the value and units of the last LEVEL setting. (Note: The POWER READOUT displays the last LEVEL setting until **[dBm]** is pressed; while the entry menu shows the latest numbers as they are keyed in.) After the desired power setting has been keyed in, press **[dBm]** to change the instrument's output and POWER READOUT to the newly selected level.

Also, note that fine adjustments of power can be made at any time by activating the digi-dial and up/down key section of the DATA ENTRY selection area. In order to do so, first press the **[ENTRY ON]** key (its lamp will light to indicate that it is active). You may now change the power, using the digi-dial or the up/down keys. To change the power step resolution of the digi-dial and up/down keys, press **[ENTRY RESOLUTION]**. After doing so, use the up/down keys, or the numeric keypad and dBm units key, to select the desired step resolution. The entry menu will show "POWER RESOLUTION," while you are adjusting the resolution. After the resolution is set, press **[LEVEL]** to again allow you to adjust RF POWER in the newly set resolution increments. When finished using the digi-dial and up/down keys, press **[ENTRY ON]** to disable their operation, so that erroneous information will not be entered if the dial or keys are touched accidentally.

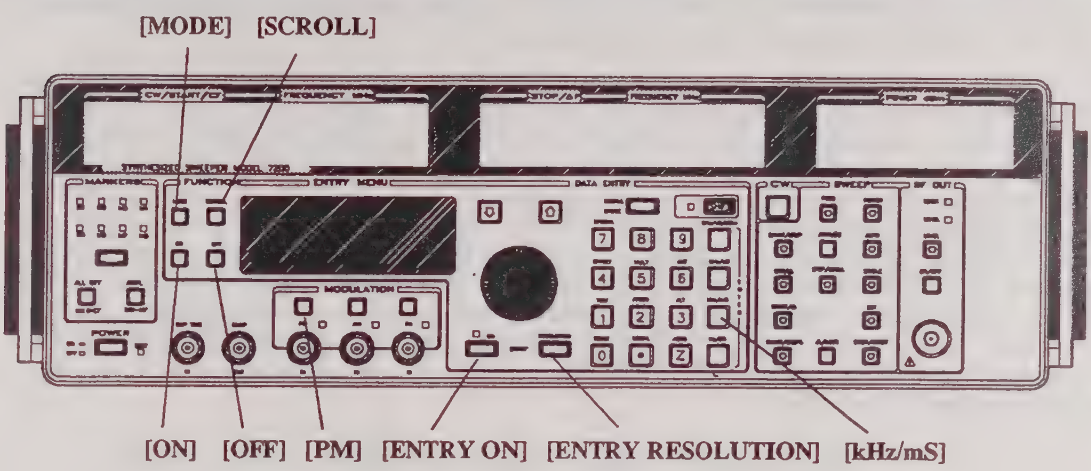


*Figure 2.4: Pulse modulation*

## 2.4 PULSE MODULATION

*NOTE: Internal modulation is functional only in instruments with Option 24.*

The Pulse Modulation function has a number of programmable modes and parameters. When the [PM] button in the MODULATION section is pressed, the entry menu display shows the following: the last mode, whether PM is on or off, and the last parameter with its value. Use the **[MODE]** button in the FUNCTION section to change the mode. The selection of modes are listed below:

INT = internal,
EXT + PULS = external pulse positive true,
EXT - PULS = external pulse negative true,
PM + TRIG = external rising edge trigger,
PM - TRIG = external falling edge trigger.

Use the **[SCROLL]** button in the FUNCTION section to select the parameters:

RATE,
WDTH (width),
DELY (delay).

When either RATE, WDTH or DELY is selected, the appropriate numeric value may be entered via the data entry system. The **[ON]** and **[OFF]** buttons in the FUNCTION section turn the modulation on and off.

For example, to set an internal 10 kHz rate 50 μs width pulse with a sync to output delay of 300 ns:

**[PM] [MODE..] [SCROLL..] [10] [kHz] [SCROLL] [50] [μs] [SCROLL] [.3] [μs] [ON]**

When you first press **[PM]**, the entry menu will display the last setting. Press **[MODE]** repeatedly until "INT" is displayed in the entry menu. Now press **[SCROLL]** repeatedly until "RATE" appears in the entry menu. Key in the desired numeric value **[10]** followed by the appropriate units **[kHz]**. Note that the new value is displayed in the entry menu as it is keyed in, but does not become effective until the units button is pressed. Press **[SCROLL]** again and "WDTH" appears on the entry menu display. Again, use the numeric entry to enter the value.

Press [**SCROLL**] again and "DELY" appears on the entry menu display. As before, use the numeric entry to enter the value. (Since there is no 'ns' button the value 300 ns must be entered as .3 µs.) Now, press [**ON**] to activate Pulse Modulation.

As stated in previous sections, fine adjustment of RATE, WDTH, or DELY may be made at any time. To do so, press [**SCROLL**] to select the parameter to be adjusted, then activate the digi-dial and up/down key section of the DATA ENTRY selection area. Press the [**ENTRY ON**] key (its LED will light to indicate that it is active). You may now change the RATE, WIDTH, or DELAY using the digi-dial or the up/down keys. To change the resolution of the digi-dial and up/down keys (any parameter), press [**ENTRY RESOLUTION**]. You may then use the up/down keys, or the numeric keypad and appropriate units key, to select the desired step resolution. The entry menu will show "RATE," "WDTH," or "DELY RESOLUTION" while you are adjusting. After the resolution is adjusted, press [**PM**] again to allow adjusting the parameter with the newly set resolution increments. When finished using the digi-dial and up/down keys, press [**ENTRY ON**] for the second time to disable their operation, so that erroneous information will not be entered if the dial or keys are touched accidentally.

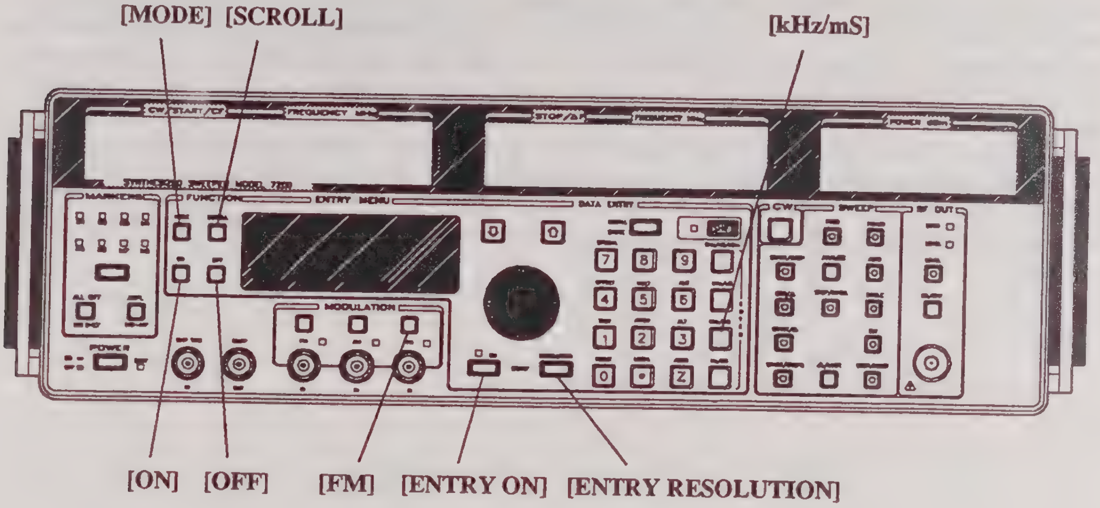


*Figure 2.5: Frequency modulation*

## 2.5 FREQUENCY MODULATION

*NOTE: Internal modulation is functional only in instruments with Option 24.*

The Frequency Modulation function has a number of programmable modes and parameters. When the [FM] button in the MODULATION section is pressed, the entry menu display shows: the last mode, whether FM is on or off, and the last parameter with its value. To select Narrow FM, press [SHIFT] [FM]. To return to Wide FM, press [SHIFT] [FM] again. The Narrow FM mode is indicated by 'FMn' in the entry menu display. Use the **[MODE]** button in the FUNCTION section to change the mode:

SIN = sine wave,
SQR = square wave,
TRI = triangle wave,
EXT = external source.

Use the **[SCROLL]** button in the FUNCTION section to select the parameters:

RATE,
DEV (Deviation)

When either RATE or DEV is selected, the appropriate numeric value may be entered via the data entry system. The **[ON]** and **[OFF]** buttons in the FUNCTION section turn the modulation on and off.

For example, to set a 10 kHz sine wave modulation of 300 kHz deviation input:

**[FM] [MODE..] [SCROLL..] [10][kHz] [SCROLL] [300] [kHz] [ON]**

When you first press **[FM]**, the entry menu display will show the last setting. Press **[MODE]** repeatedly until the desired mode is displayed on the entry menu display. Now press **[SCROLL]** repeatedly until "RATE" appears on the entry menu display. Key in the desired numeric value **[10]** followed by **[kHz]**. Note that the value is displayed on the entry menu display as it is keyed in. The new value becomes effective only when the units button (i.e., **[GHz]**, **[MHz]**, **[kHz]** or **[Hz]**) is pressed. Press **[SCROLL]** again and "DEV" appears in the entry menu display. Again, use the numeric entry to set the value. Press **[ON]** to turn on the Frequency Modulation.

Also, note that fine adjustment of either RATE or DEV may be made at any time. In order to do so, use **[SCROLL]** to select the parameter to be adjusted, and then activate the digi-dial and up/down key section of the DATA ENTRY selection area. Press the **[ENTRY ON]** key (its LED will light to indicate that it is active). You may now change the rate or deviation using the digi-dial or the up/down keys. To change the step resolution of the digi-dial and up/down keys (any parameter), press **[ENTRY RESOLUTION]**. You may then use the up/down keys, or the numeric keypad and appropriate units key, to select the desired step resolution. The entry menu will show "RATE," "WDTH," or "DELY RESOLUTION" while you are adjusting. After the resolution is adjusted, press **[FM]** again to allow adjusting the parameter with the newly set resolution increments. When finished using the digi-dial and up/down keys, press **[ENTRY ON]** for the second time to disable their operation, so that erroneous information will not be entered if the dial or keys are touched accidentally.

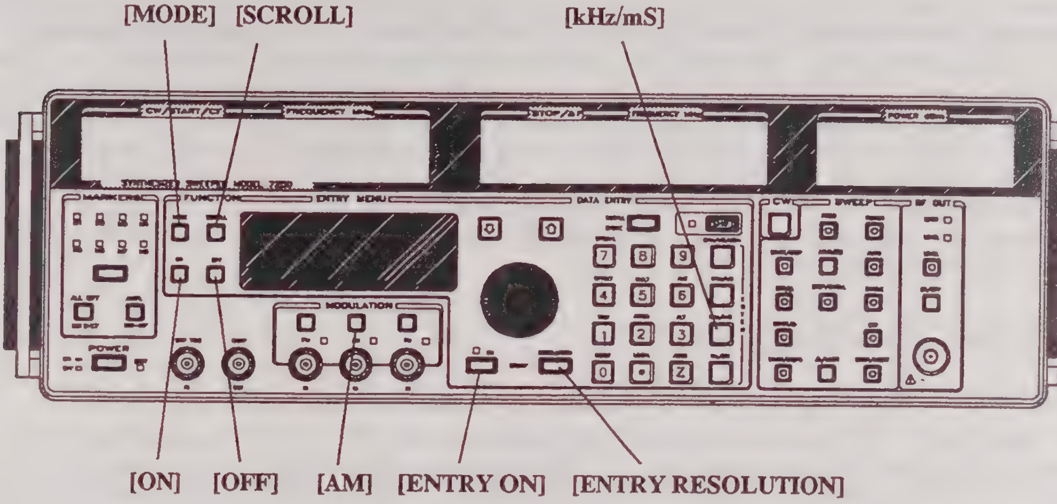


*Figure 2.6: Amplitude modulation*

## 2.6 AMPLITUDE MODULATION

*NOTE: Internal modulation is functional only in instruments with Option 24.*

The Amplitude Modulation function has a number of programmable modes and parameters. When the [AM] button in the MODULATION section is pressed, the entry menu shows: the last mode, whether AM is on or off, and the last parameter with its value. Use the **[MODE]** button in the FUNCTION section to change the mode:

SIN = sine wave,
SQR = square wave,
TRI = triangle wave,
EXT = external source.

Use the **[SCROLL]** button in the FUNCTION section to select the parameters:

RATE,
DEPTH.

When either RATE or DEPTH is selected, the appropriate numeric value may be entered via the data entry system. The **[ON]** and **[OFF]** buttons in the FUNCTION section turn the modulation on and off.

For example, if you wish to set a 10 kHz sine wave modulation, at a depth of 30%:

**[AM] [MODE..] [SCROLL..] [10] [kHz] [SCROLL] [30] [%] [ON]**

When you first press **[AM]**, the entry menu display will automatically show the last setting. Press **[MODE]** repeatedly until the desired mode is displayed on the entry menu display. Now press **[SCROLL]** repeatedly until "RATE" appears on the entry menu display. Key in the desired numeric value **[10]** followed by **[kHz]**. Note that the value is shown on the entry menu display as it is keyed in. The new value becomes effective only when the units button is pressed. Press **[SCROLL]** again and "DEPTH" appears on the entry menu display. Again, use the numeric entry to set the value. Note that the only valid units are '%'. Now press **[ON]** to turn on the Amplitude Modulation.

As with previous operations, fine adjustment of either RATE or DEPTH may be made at any time by first using **[SCROLL]** to select the parameter to be adjusted, and then activating the digi-dial and up/down key section of the DATA ENTRY selection area.

In order to change the frequency step resolution, press the **[ENTRY RESOLUTION]** key (its LED will light to indicate that it is active). You may now change the rate or deviation using the digi-dial or the up/down keys. To change the step resolution of the digi-dial and up/down keys (any parameter), press [**ENTRY RESOLUTION**]. You may then use the up/down keys, or the numeric keypad and appropriate units key, to select the desired step resolution. The entry menu will show "RATE," "WDTH," or "DELY RESOLUTION" while you are adjusting. After the resolution has been adjusted, press [AM] again to allow adjusting the parameter with the newly set resolution increments. When finished using the digi-dial and up/down keys, press [**ENTRY ON**] for the second time to disable their operation, so that erroneous information will not be entered the dial or keys are touched accidentally.

## *2.7* SWEEP-RELATED FEATURES

### *2.7.1* Front Panel Connectors

The 'RAMP OUT' BNC connector on the front panel provides a 0V to +10V output, which is proportional to progress between sweep limits. The ramp output is used in all types of sweeping (frequency or power sweeping in analog or digital modes). When frequency and power are swept simultaneously, the ramp output represents frequency. In CW mode, the output is a fixed voltage proportional to the output frequency (with 0 and +10 V representing the limits of the instrument's frequency range).

The 'SWP TRIG IN' BNC connector on the front panel accepts an external sweep trigger input in the form of a TTL low-going pulse (width ≥50 ns).

For additional sweep-related signals, see 'Rear Panel BNCs' (section 2.15.1).

### *2.7.2* Markers (Used in Frequency Sweeping)

**MARKERS:** M1 through M8 function the same way. When the light above the selected marker is lit, it indicates the marker is enabled.

The entry menu display will show a marker and its frequency value and if a marker is on or off. Use the data entry pad, the digi-dial or the up/down keys to set the frequency, and the ON or OFF keys to enable or disable a marker.

**PROG:** This function displays the selected marker in the entry menu display. Each time you press the **[PROG]** key it increments to the next marker (use **[SCROLL]** to decrement). You can only change the frequency of a marker, or turn it on or off, while that marker is displayed.

**ON or OFF:** These keys are used to enable or disable a marker that is displayed in the entry window.

**ALL OFF:** This feature will turn all markers off and back on to the last programmed marker setup. Marker frequency values will remain stored in memory and can be recalled when the selected marker is activated.

**AMPL:** Functioning markers are usually displayed as intensified dots on a CRT display. By selecting [AMPL], enabled makers are displayed as amplitude spikes (an abrupt discontinuity in the sweep trace).

**MX → CF:** This function sets the center frequency of the sweep to the marker displayed. Select any marker M1 through M8, then press **[SHIFT]** **[MX → CF]** to change the center frequency of the sweep of the selected marker frequency. The frequency length will not change unless the new sweep limit is greater than the frequency range of the unit. The instrument will automatically scale the frequency length within its operating frequency range.

**MX - MY:** This function displays the difference between M3 and M1.

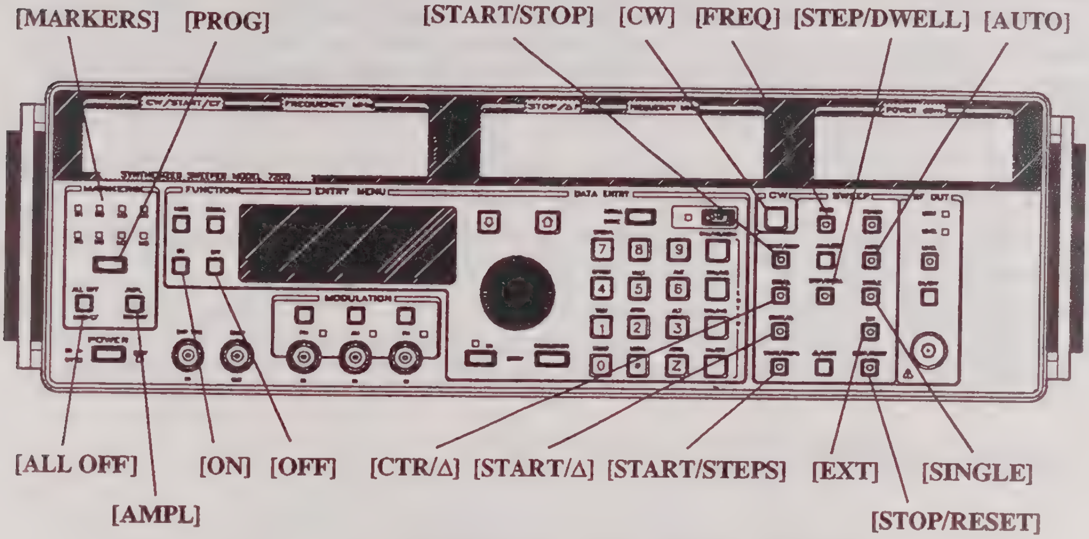


*Figure 2.7: Frequency step/dwell sweep operation*

## 2.8 FREQUENCY STEP/DWELL SWEEP OPERATION

Frequency Sweep has a number of programmable features, modes of operation, and parameters. To initiate a sweep, press **[FREQ]** in the SWEEP selection area. The LED in the CW button will extinguish, while the LED in the FREQ button and any other associated buttons will light. Pressing [CW] will return operation to a fixed frequency.

**STEP/DWELL:** Initiates Step/Dwell Sweep mode. This button permits setting both the step size and the dwell time for each step. These parameters are used by all of the previously described sweep modes. Press **[STEP/DWELL]** and either "FREQ STEP SIZE" or "FREQ DWELL TIME" will appear on the top line of the entry menu. You may key in a numeric value ending with a terminating key, or use the digi-dial or the up/down keys, to set the numeric value. Pressing **[STEP/DWELL]** again will enable the other parameter for entry. Parameters set with this button are active for *all* sweep modes.

**START/STOP:** This mode of operation causes a sweep up or down from a presettable start frequency to a presettable stop frequency. Press **[START/STOP]** and either "START FREQUENCY" or "STOP FREQUENCY" will appear on the top line of the entry menu. You may key in a numeric value, ending with a terminating key, or use the digi-dial or the up/down keys to set the numeric value. Pressing **[START/STOP]** again will enable the other end of the desired sweep for entry. Note that the sweep can be increasing or decreasing in frequency.

**CTR/Δ:** This selection provides a preset frequency sweep pattern (up or down) centered symmetrically around a given preset frequency. Press **[CTR/Δ]** and either "CENTER FREQUENCY" or "DELTA FREQUENCY" will appear in the entry menu on the top line of the display. You may key in a numeric value, ending with a terminating key, or use the digi-dial or the up/down keys to set the numeric value. Pressing **[CTR/Δ]** again will enable the other parameter for entry. In order to sweep down through the selected center frequency, enter a '-' sign prior to entering the DELTA FREQUENCY numeric value.

**START/Δ:** This mode is the same as CTR/Δ except that the sweep originates at a given start frequency rather than sweeping symmetrically about a center frequency.

**START/STEPS:** This mode allows sweeping up or down from a preset start frequency through a preset number of steps. Press **[START/STEPS]** and either "START FREQUENCY" or "NUMBER OF STEPS" will appear on the top line of the entry menu. You may key in a numeric value, ending with a terminating key, by using the digi-dial or the up/down keys to set the numeric value. Pressing [START/STEPS] again will enable the other parameter for entry. Note that any 'ENTER' key may be used to terminate the numeric entry for NUMBER OF STEPS. To sweep down from the start frequency, enter a '-' sign prior to entering the NUMBER OF STEPS numeric value.

**AUTO:** The AUTO sweep function, when enabled, causes the previously set sweep mode to continuously recycle.

**SINGLE:** In SINGLE sweep, a single cycle of the previously set sweep mode will occur.

**EXT:** Allows the same action as the front panel [SINGLE] button, with the exception that the action is initiated by a trigger (TTL low) from an external source.

**STOP/RESET:** Pressing this button will stop the sweep and allow the frequency to be manually adjusted using either the digi-dial or the up/down keys; keypad entry is not permitted. Pressing the STOP/RESET button a second time will reset the sweep to the previously set sweep conditions.

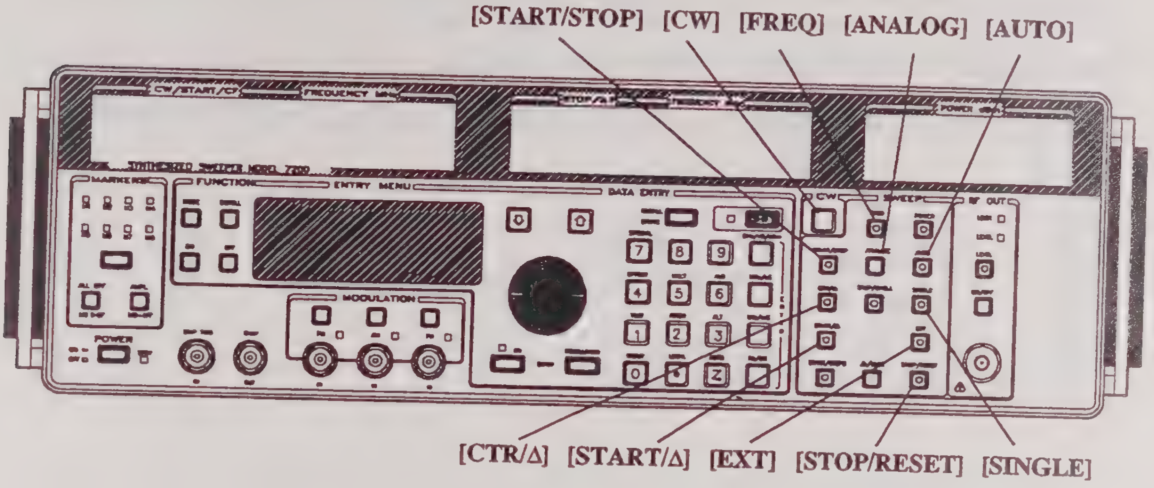


*Figure 2.8: Frequency analog sweep operation*

## 2.9 FREQUENCY ANALOG SWEEP OPERATION

The Frequency Sweep has a number of programmable features, modes of operation, and parameters. To initiate the sweep press **[FREQ]** in the SWEEP selection area. The LED in the CW button will extinguish, while the LED in the FREQ button and any other associated buttons will light. Pressing **[CW]** will return operation to a fixed frequency.

**ANALOG:** Initiates Analog Sweep mode. This button permits setting Analog Sweep time. These parameters are used by all of the previously described sweep modes. Press **[ANALOG]** and "FREQUENCY SWEEP TIME" will appear on the top line of the entry menu. You may key in a numeric value ending with a terminating key, or use the digi-dial or the up/down keys, to set the numeric value. Pressing **[ANALOG]** again will enable the other parameter for entry. Parameters set with this button are active for *all* sweep modes.

**START/STOP:** This mode of operation causes a sweep up or down from a presettable start frequency to a presettable stop frequency. Press **[START/STOP]** and either "START FREQUENCY" or "STOP FREQUENCY" will appear on the top line of the entry menu. You may key in a numeric value, ending with a terminating key, or use the digi-dial or the up/down keys to set the numeric value. Pressing **[START/STOP]** again will enable the other end of the desired sweep for entry. Note that the sweep can be increasing or decreasing in frequency.

**CTR/Δ:** This selection provides a preset frequency sweep pattern (up or down) centered symmetrically around a given preset frequency. Press **[CTR/Δ]** and either "CENTER FREQUENCY" or "DELTA FREQUENCY" will appear in the entry menu on the top line of the display. You may key in a numeric value, ending with a terminating key, or use the digi-dial or the up/down keys to set the numeric value. Pressing **[CTR/Δ]** again will enable the other parameter for entry. If it is desired to sweep down through the selected center frequency, enter a '-' sign prior to entering the DELTA FREQUENCY numeric value.

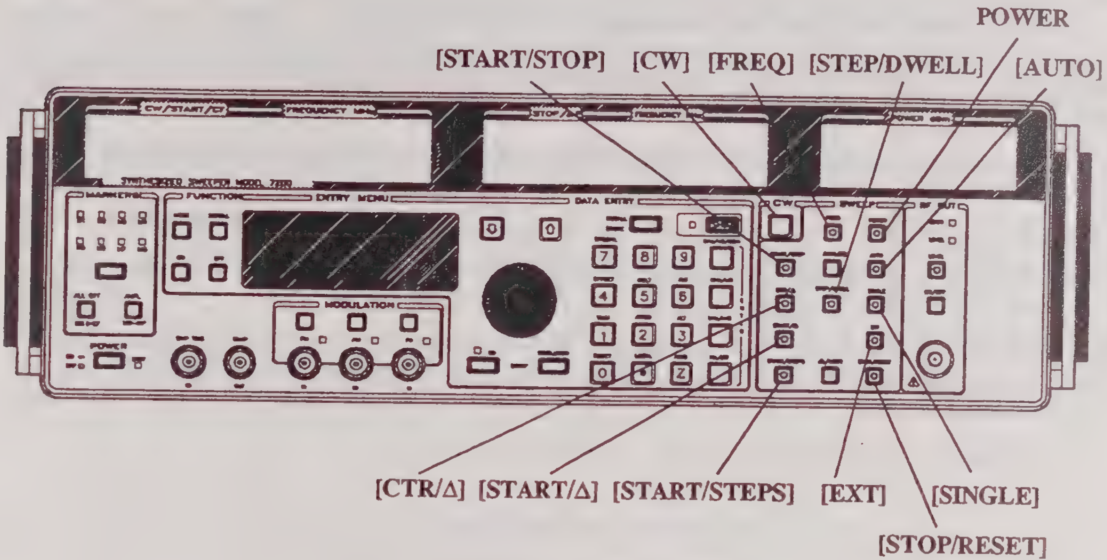
**START/Δ:** This mode operates in a manner identical to CTR/Δ except that the sweep originates at a given start frequency rather than sweeping symmetrically about a center frequency.

**AUTO:** The AUTO sweep function, when enabled, causes the previously set sweep mode to continuously recycle.

**SINGLE:** In SINGLE sweep, a single cycle of the previously set sweep mode will occur.

**EXT:** Allows the same action as the front panel [SINGLE] button, with the exception that the action is initiated by a trigger (TTL low) from an external source.

**STOP/RESET:** Pressing this button will stop the sweep and allow the frequency to be manually adjusted using either the digi-dial or the up/down keys; keypad entry is not permitted. Pressing the STOP/RESET button a second time will reset the sweep to the previously set sweep conditions.



*2.9: Step/dwell power sweep*

## 2.10 STEP/DWELL POWER SWEEP OPERATION

The Power Sweep has a number of features, modes of operation and parameters which may be set. To initiate the sweep press **[POWER]** in the SWEEP selection area. When doing so, the LED in the POWER button and any other associated buttons will light. Pressing **[POWER]** will return operation to a fixed level.

**STEP/DWELL:** Initiates Step/Dwell Sweep mode. This button permits setting both the step size and the dwell time for each step. These parameters are used by all of the previously described sweep modes. Press **[STEP/DWELL]** and either "POWER STEP SIZE" OR "POWER DWELL TIME" will appear on the top line of the entry menu. You may key in a numeric value ending with a terminating key, use the digi-dial, or use the up/down keys to set the numeric value. Pressing **[STEP/DWELL]** again will enable the other parameter for entry. Parameters set with this button are active for *all* sweep modes.

**START/STOP:** This mode of operation causes a sweep, up or down, from a presettable start level to a presettable stop level. Press **[START/STOP]** and either "START POWER" or "STOP POWER" will appear on the top line of the entry menu. You may key in a numeric value ending with a terminating key, use the digi-dial, or use the up/down keys to set the numeric value. Pressing **[START/STOP]** again will enable the other end of the desired sweep for entry. Note that the sweep can be increasing or decreasing in level.

**CTR/Δ:** This selection provides a preset frequency sweep pattern (up or down) centered symmetrically around a given preset frequency. Press **[CTR/Δ]** and either "CENTER POWER" or "DELTA POWER" will appear in the entry menu on the top line of the display. You may key in a numeric value ending with a terminating key, use the digi-dial, or the up/down keys to set the numeric value. Pressing **[CTR/Δ]** again will enable the other parameter for entry. If it is desired to sweep down through the selected center frequency, enter a '-' sign prior to entering the DELTA POWER numeric value.

**START/Δ:** This mode operates in a manner identical to **CTR/Δ** except that the sweep originates at a given start level rather than sweeping symmetrically around a center level.

**START/STEPS:** This mode allows sweeping up or down from a preset start level through a preset number of steps. Press **[START/STEPS]** and either "START POWER" or "NUMBER OF STEPS" will appear on the top line of the entry menu. You may key in a numeric value ending with a terminating key, use the digi-dial, or the up/down keys to set the numeric value. Pressing [START/STEPS] again will enable the other parameter for entry. Note that any of the 'units' keys may be used to terminate the numeric entry for NUMBER OF STEPS. To sweep down from the start level, enter a '- ' sign prior to entering the NUMBER OF STEPS numeric value.

**AUTO:** The AUTO sweep function when enabled causes the previously set sweep mode to continuously recycle.

**SINGLE:** In SINGLE sweep, a single cycle of the previously set sweep mode will occur.

**EXT:** This mode allows the same action as the front panel SINGLE button, with the exception that the action is initiated by a trigger (TTL low) from an external source.

**STOP/RESET:** Pressing this button will stop the sweep and allow the level to be manually adjusted using either the digi-dial or the up/down keys; keypad entry is not possible. Pressing the [STOP/RESET] button a second time will reset the sweep to the previously set sweep conditions.

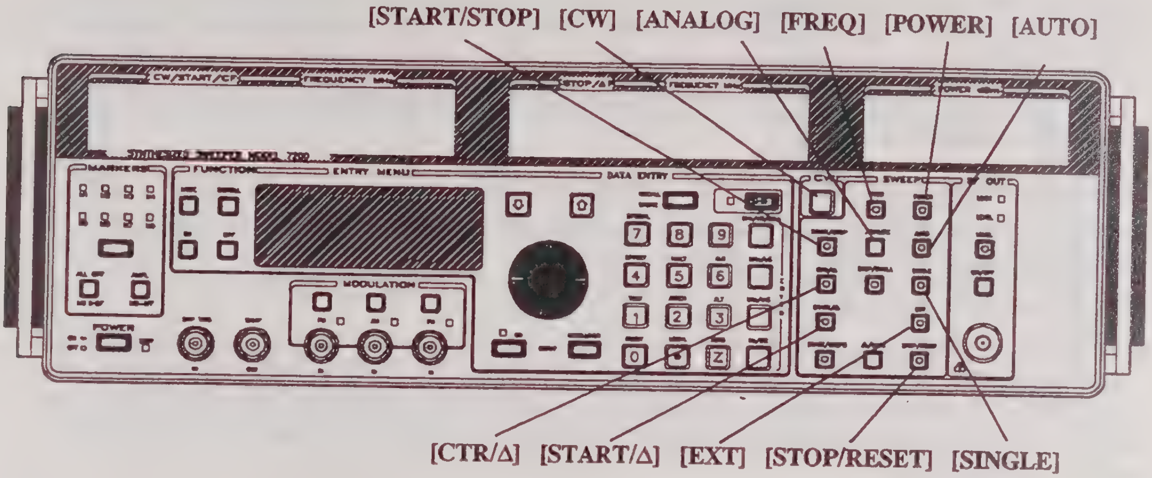


*Figure 2.10: Analog power sweep operation*

## *2.11* ANALOG POWER SWEEP OPERATION

The Power Sweep function has a number of features, modes of operation and parameters which may be set. To initiate the sweep press **[POWER]** in the SWEEP selection area. When doing so, the LED in the **[POWER]** button and any other associated buttons will light. Pressing **[POWER]** will return operation to a fixed level.

ANALOG: Initiates Analog Sweep mode. This button permits setting Analog Sweep time. Press [ANALOG]; "POWER SWEEP TIME" will appear on the top line of the entry menu. You may key in a numeric value ending with a terminating key, use the digi-dial, or use the up/down keys to set the numeric value. Parameters set with this button are active for *all* sweep modes.

START/STOP: This mode of operation causes a sweep, up or down, from a presettable start level to a presettable stop level. Press **[START/STOP]** and either "START POWER" or "STOP POWER" will appear on the top line of the entry menu. You may key in a numeric value ending with a terminating key, use the digi-dial, or use the up/down keys to set the numeric value. Pressing **[START/STOP]** again will enable the other end of the desired sweep for entry. Note that the sweep can be increasing or decreasing in level.

CTR/Δ: This selection provides a preset frequency sweep pattern (up or down) centered symmetrically around a given preset frequency. Press [CTR/Δ] and either "CENTER POWER" or "DELTA POWER" will appear in the entry menu on the top line of the display. You may key in a numeric value ending with a terminating key, use the digi-dial, or the up/down keys to set the numeric value. Pressing [CTR/Δ] again will enable the other parameter for entry. If it is desired to sweep down through the selected center frequency, enter a '-' sign prior to entering the DELTA POWER numeric value.

START/Δ: This mode operates in a manner identical to **CTR/Δ** except that the sweep originates at a given start level rather than sweeping symmetrically around a center level.

AUTO: The AUTO sweep function when enabled causes the previously set sweep mode to continuously recycle.

SINGLE: In SINGLE sweep, a single cycle of the previously set sweep mode will occur.

EXT: This mode allows the same action as the front panel SINGLE button, with the exception that the action is initiated by a trigger (TTL low) from an external source.

**STOP/RESET:** Pressing this button will stop the sweep and allow the level to be manually adjusted using either the digi-dial or the up/down keys; keypad entry is not possible. Pressing the [STOP/RESET] button a second time will reset the sweep to the previously set sweep conditions.

## 2.12 SWEEP COMBINATIONS

### 2.12.1 Frequency and Power Step/Dwell:

When frequency and power sweep are used simultaneously, they partially interact. The main factor which determines their interaction is dwell time.

*When Dwell times are equal:*

The unit is in Power Slope Mode. The power step size is calculated so that the frequency and power sweeps have the same number of steps. For example, if a 10 GHz frequency sweep is combined with a 10 dB power sweep, and the frequency step size is 1 GHz, the power sweep step size will be set to 1 dB, so that both sweeps have 10 steps. Attempting to change the power step size would have no effect.

*When Dwell times are NOT equal:*

If the frequency step dwell time is greater, one complete power sweep will occur for each frequency step. If the power step dwell time is greater, one complete frequency sweep will occur for each power step.

### 2.12.2 Frequency and Power Analog:

The instrument is in Power Slope Mode. When the power tracks the Frequency Sweep so that Delta Power coincides with Delta Frequency, the Power SWEEP time is the same as the frequency sweep time.

### 2.12.3 Frequency and Power Step/Dwell and Analog:

The mode (Frequency or Power) that is Analog takes one complete sweep for each step of the mode (Frequency or Power) that is Step/Dwell.

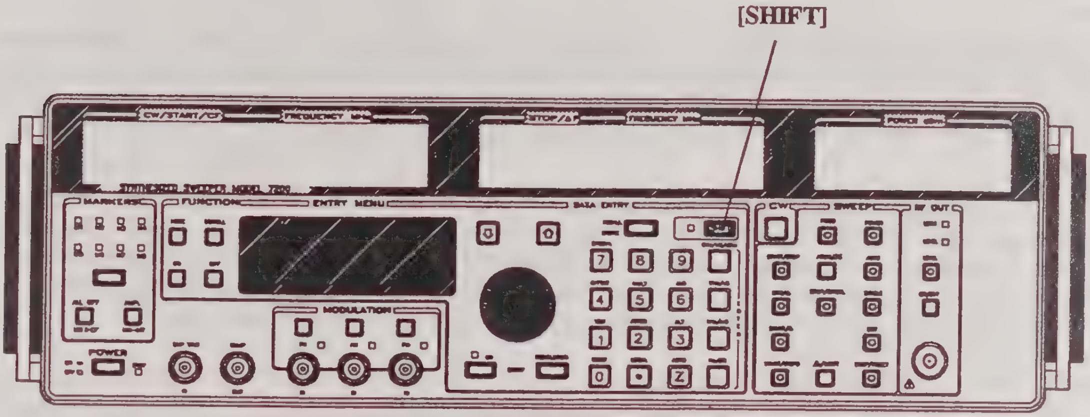

[SHIFT]
CW/START/CF
FREQUENCY MHz
STOP/ΔF
FREQUENCY MHz
POWER dBm
SYNTHESIZED SWEEPER MODEL 7200
MARKERS
FUNCTION
ENTRY MENU
DATA ENTRY
CW
SWEEP
RF OUT
MODULATION
POWER
7
8
9
4
5
6
1
2
3
0

*Figure 2.11: Shifted functions*

## 2.13 SHIFTED FUNCTIONS

Shifted functions are labeled in blue. Each shifted function is activated by first pressing [SHIFT] followed by the desired function key. When the SHIFT key is pressed, the LED to its left will illuminate until the function key is pressed.

### 2.13.1 Reset

When this function is activated, the instrument parameters are set to their default conditions:

| Parameter | Default Condition |
|---|---|
| Sweep Modes | Off |
| CW Frequency | Minimum |
| RF | On |
| RF Level | 0 dBm |
| Amplitude Modulation | Off |
| AM Rate | 1 kHz |
| AM Mode | Sine |
| AM Depth | 50% |
| Frequency Modulation | Off |
| FM Rate | 1 kHz |
| FM Mode | Sine |
| FM Deviation | 1 MHz |
| Pulse Modulation | Off |
| PM Rate | 100 kHz |
| PM Mode | Internal |
| PM Width | 5 us |
| PM Delay | 0 ns |

### *2.13.2* Local

This function causes the instrument to deactivate the remote mode. All parameters which have been programmed, while in the remote mode, remain in effect. With this function, full front panel control of the instrument is possible.

### *2.13.3* Adrs

The ADRS function, when first activated, displays "GPIB ADDRESS" on the top row of the entry menu display; the present setting is displayed on the lower row. The address value may be changed (the valid range is 0 to 30) with the keypad, the digi-dial, or the up/down buttons. If the keypad is used to enter a new value, an ENTER key (any one) must be pressed to terminate the entry process. Selecting any other function will clear the entry menu and display the new function.

### *2.13.4* Test

The self test exercises a number of instrument functions to determine whether the various circuits are operating properly.

### *2.13.5* Atten

The ATTEN function allows setting the step attenuator to a fixed value. Through this function, the instrument output RF POWER may be controlled over a limited range using the leveling loop. For example, if the ATTENUATOR is set to -20 dBm, the instrument may be set from -40 to -5 dBm (20 dB below the attenuator setting, 15 dB above). This range corresponds to the instrument RF POWER being set from +15 dBm to -20 dBm. If the instrument cannot achieve sufficient power to provide 15 dBm, the level indicator will go out. This feature allows the RF POWER to be varied across what would ordinarily be an attenuator switch point (and would likely cause a small interruptions in linearity).

### *2.13.6* Alt

The ALT function is designed to allow the instrument control system to alternate between any two or more stored SWEEP settings. The entry menu displays "ALT BETWEEN:". Enter the stored memory numbers (for example, ‘134’ to alternate between memories 1, 3 and 4).

### *2.13.7* Offset

The OFFSET function allows the actual RF output to be offset from the entered CW FREQUENCY. The offset may be positive or negative, with whatever resolution is available in the instrument. The maximum value is the upper frequency limit of the instrument. The value of the offset may be entered with the keypad, the digi-dial, or the up/down buttons. A terminating ENTRY key must follow the keypad input. If the sum of the CW FREQUENCY and the positive or negative offset is beyond the limits of the instrument, the limit value is the maximum possible output. When entering CW FREQUENCY, the entry menu shows the entered value; the CW/START/CF display shows the actual output frequency.

### *2.13.8* Mult

The MULT function allows the operator to control a frequency multiplier or extender (such as any of the Giga-tronics Series 800 Models) by entering the desired output frequency from the keypad of the instrument. Both the entry menu and CW/START/CF displays will indicate the final desired output frequency. However, the actual instrument output RF frequency will be the displayed value divided by the multiplication factor. The value of the multiplication factor may be entered with the keypad, the digi-dial, or the up/down buttons. A terminating ENTRY key must follow any keypad input. For example, if a times-three frequency multiplier is in use, and the selected output is 30 GHz: MULT will be set to three, the frequency displays will be set to 30 GHz, and the instrument will produce a 10 GHz output.

### 2.13.9 ALC

The ALC function is used to select different modes of operation for the automatic level control system; generally, the different modes use different sources of level feedback. The modes are 'INT' (the internal detector, 'EXT+' (positive polarity external detector), 'EXT-' (negative polarity internal detector), 'POWER MTR' (external power meter), and 'UNLEVELED' (no level feedback; the output level is pegged at maximum).

### 2.13.10 Store

See the section on storing panel setups (section 2.1.6).

## 2.14 SPECIAL

Activating the SPECIAL feature, followed by a numeric entry, will permit the use of special functions. Press **[SHIFT] [SPECIAL]**; the entry menu will display "Enter Special # or Scroll". **[SCROLL]** allows you to step through the available special functions; if you know the number of the special function you want, enter the number to jump directly to that function.

### 2.14.1 Special Functions and Usage

00 "Erase Memories". Press [ON] to erase stored setup memories 0 to 9.

01 "Model & Version". Press [ON] to display the instruments model number, frequency range and software version.

02 "Display Bright". Press [ON] to adjust entry menu display brightness.

11 "Ext Ref". Select 5 MHz or 10 MHz external reference (see Option 11).

20 "RF Off @ PWR Up". Press [ON] or [OFF] to enable or disable this function.

30 "Special Step Sweep". In this version of step sweep, when the dwell time is set, it is interpreted as the total sweep time, and the step size is calculated by the instrument.

40 "HP GPIB Syntax". Press [ON] to activate '7200' GPIB Syntax (emulation of HP 8340).

41 "GT GPIB Syntax". Press [ON] to activate '1026' GPIB Syntax (emulation of Giga-tronics 1026).

50 "YIG Fast Mode". Press [ON] or [OFF] to enable or disable (FOR TEST USE ONLY).

51 "Unlocked Mode". Press [ON] or [OFF] to enable or disable (FOR TEST USE ONLY).

99 "Clear Specials". Press [ON] to reset all special to default.

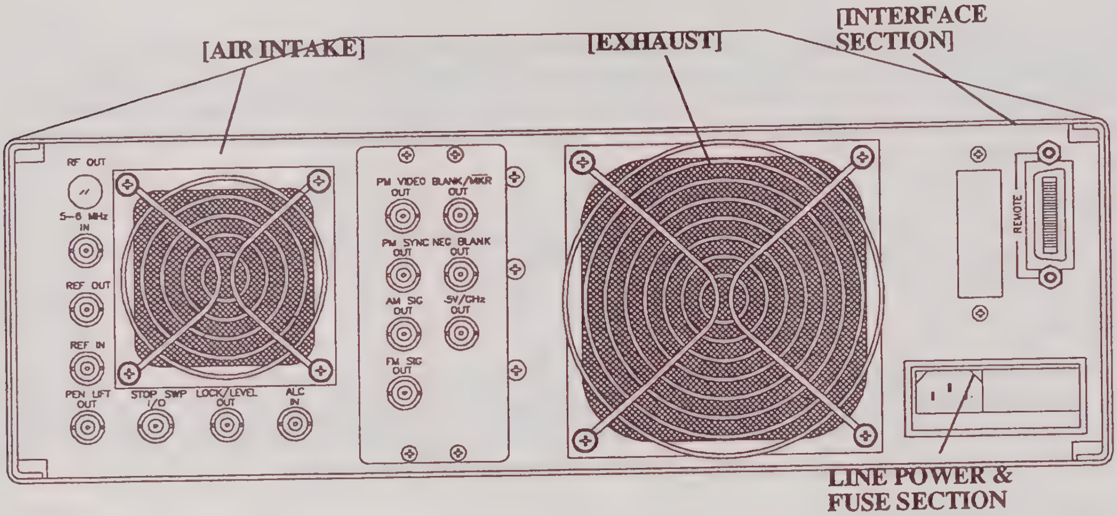

[AIR INTAKE]
[EXHAUST]
[INTERFACE SECTION]
RF OUT
5–6 MHz IN
REF OUT
REF IN
PEN LIFT OUT
STOP SWP I/O
LOCK/LEVEL OUT
ALC IN
PM VIDEO OUT
BLANK/$\overline{\text{MKR}}$ OUT
PM SYNC OUT
NEG BLANK OUT
AM SIG OUT
.5V/GHz OUT
FM SIG OUT
REMOTE
LINE POWER & FUSE SECTION

*Figure 2.12: Model 7200 rear panel*

## 2.15 REAR PANEL

### 2.15.1 Rear Panel BNCs

**ALC IN:** External leveling input signal, from a positive or negative polarity ZBS detector, or from an applicable power meters.

**REF IN:** External time base input signal, 10 MHz ±1 X $10^{-6}$ or better, 0.5 to 5 Vpp (overrides the internal time base).

**REF OUT:** Buffered time base output, 10 MHz, 2 Vpp into 50 Ω, sine wave, derived from internal or external time base.

**5-6 MHz IN:** 2 Vpp 5-6 MHz input for controlling the frequency of the signal generator; permits fine frequency resolution control from an external synthesized source.

**STOP SWEEP IN/OUT:** TTL level signal, low input to stop a frequency sweep, or low output to indicate that the sweep has been stopped.

**LOCK/LEVEL OUT:** TTL high indicating that the output frequency is phase locked and the output power is leveled.

**PEN LIFT:** TTL compatible output; low during sweep, high during retrace.

**PM VIDEO OUT:** TTL level (approximately 1 V into 50 Ω) pulse modulation envelope waveform.

**PM SYNC OUT:** TTL level (approximately 1 V into 50 Ω), 50 ns wide trigger pulse out, coincident with the leading edge of the pulse modulation envelope waveform.

**AM SIG OUT:** 2 Vpp amplitude modulation waveform output.

**FM SIG OUT:** 2 Vpp frequency modulation waveform output.

**BLANK/MKR OUT:** +5 V during band change, filter change, and retrace; 0 V during sweep, and -5 V during markers.

**NEG BLANK OUT:** 0 V during sweep; -5 V during band changes, filter changes, and retrace.

**.5 V/GHz OUT:** Output signal directly proportional to output frequency.

### 2.15.2 Line Power and Fuse Section

**POWER INPUT** (AC Plug): A 3-terminal polarized connector with safety ground wired to the chassis.

**LINE SELECTION** (PC Board): The card can be oriented four ways to select four different line voltages: 100, 120, 220, 240 volts.

**FUSE HOLDER**: Retains the power fuse, which should be 4A 4AG Slo-Blo for 100/120 volt operation and 2A 3AG Slo-Blo for 220/240 volt operation.

### 2.15.3 Interface Section

**REMOTE** (24 pin connector): Provides an interface connection between the Model 7200 and other equipment. The interface type is GPIB IEEE-488-1978.

## 2.16 IEEE-488 INTERFACE

Model 7200 permits data bus control in accordance with the IEEE Standard Digital Interface for Programmable Instruments, IEEE-STD 488-1978. The table below shows which subsets of the standard are implemented in the 7200.

| Subset | Title | 7200 Implementation |
|---|---|---|
| SH1 | Source Handshake | Complete Capability |
| AH1 | Acceptor Handshake | Complete Capability |
| T8 | Talker | Basic Talker, No Serial Poll |
| TEO | Extended Talker | No Capability |
| L4 | Listener | Basic Listener, No Listen Only, Unaddressed if MTA |
| LEO | Extended Listener | No Capability |
| SRO | Service Request | No Capability |
| RL2 | Remote/Local | Complete Capability |
| PPO | Parallel Poll | No Capability |
| DCO | Device Clear | No Capability |
| DTO | Device Trigger | No Capability |
| CO | Controller | No Capability |

### 2.16.1 Interface Hardware Configuration

A standard IEEE-488 interface cable may be used to connect the 7200 to a controller. The 24-pin interface connector, located on the rear panel of the 7200, has the following pin assignments:

| Pin | Signal | Pin | Signal | Pin | Signal |
|---|---|---|---|---|---|
| 1 | D101 | 9 | IFC | 17 | REN |
| 2 | D102 | 10 | SRQ | 18 | GND (6) |
| 3 | D103 | 11 | ATN | 19 | GND (7) |
| 4 | D104 | 12 | Shield | 20 | GND (8) |
| 5 | EO1 | 13 | D105 | 21 | GND (9) |
| 6 | DAV | 14 | D106 | 22 | GND (10) |
| 7 | NRFD | 15 | D107 | 23 | GND (11) |
| 8 | NDAC | 16 | D108 | 24 | GND Logic |

### *2.16.2* Address Assignment

The remote control address is assigned from the front panel of the instrument (see ‘ADRS’ under "Shifted Functions"). The available range of addresses is 0 through 30.

### *2.16.3* Command Interpretation

The instrument uses a 40 character buffer to accept and store characters sent to it via the interface. Spaces are ignored. The buffer’s contents are interpreted and the buffer is reset upon receipt of a character sent with the EOI line asserted or upon receipt of any of the following delimiter characters:

‘< CR >’   ‘< LF >’   ‘,’   ‘:’   ‘;’   ‘/’   ‘\’

Multiple commands may be sent in a single message if they are separated from each other by a space or one of the above delimiter characters. Each command will be interpreted individually upon receipt. Note that if spaces are used to separate commands, care must be taken to assure that the 40 character buffer does not overflow. Buffer overflow may cause some commands to be ignored.

### *2.16.4* Remote Programming, IEEE-488 Interface, 7200 Syntax

The instrument can accept commands from a remote controller over the IEEE-488 interface. The default '7200' syntax emulates the HP 8340. A separate syntax is available which emulates the Giga-tronics 1026. If you select the 1026 syntax (using the 'GT' command), you can recall the default syntax later by sending the 'HP' command).

The default syntax is designed to make Model 7200 a compatible substitute for the HP 8340 in most remote-control operations. However, differences between the 7200 and the 8340 require some alteration of the 8340 command set: new commands are added, some existing commands differ slightly from their usual function when they are applied to Model 7200, and some existing commands are unsupported. See the command descriptions in the tables below for the Giga-tronics implementation of these commands.

Commands in the default syntax represented in the manual by upper case letters. Some commands are followed by one or more lower case letters. These letters are interpreted as follows:

**a** -- Indicates that alphanumeric characters are expected.

**b** -- Indicates that one or more 8-bit bytes (entered in binary form) are expected.

**d** -- Indicates that a decimal number is expected. Decimal numbers may be signed. Exponents may be indicated by an 'E'; thus, '+4.5E-6' represents $4.5 \times 10^{-6}$.

**h** -- Indicates that a hexadecimal number is expected.

**n** -- Indicates that a single digit (0-9) is expected.

**t** -- Indicates that a terminator is expected. Usually, codes which specify units are used as terminators. The codes are HZ (Hz), KZ (kHz), MZ (MHz), GZ (GHz), DB (dB), DM (dBm), SC (sec), MS (msec), and US (µsec). Alternatively, a comma or line feed can be used as a terminator; this causes the instrument to scale the corresponding function to the fundamental units of Hz, dB, dBm, or seconds.

The *absence* of lower case letters in a command indicates that the command is complete as shown, and requires no variables.

The commands of in the tables which follow. Commands which are identical with existing HP 8340 commands are shown in **bold print**; all other commands are either modified or invented for application to Model 7200.

***Remote Programming Commands (7200 Syntax)***

| *Code* | *Operation* | *Example* | *Notes* |
|---|---|---|---|
| ***A1*** | ***leveling mode, internal*** | ***A1*** | ***select internal ALC mode*** |
| ***A2*** | ***leveling mode, external*** | ***A2*** | ***select external negative-detector ALC mode*** |
| ***A3*** | ***leveling mode, power meter*** | ***A3*** | ***select external power meter ALC mode*** |
| AC0 | AM correction off | (These commands are used for diagnostic purposes only.) | |
| AC1 | AM correction on | | |
| ADd | AM depth | AD40 | set AM depth to 40% |
| AF0 | Fast always off | AF0 | set all YIG drivers to 'SLOW' mode |
| AF1 | Fast always on | AF1 | set all YIG drivers to 'FAST' mode |

## Remote Programming Commands (7200 Syntax)

| Code | Operation | Example | Notes |
|---|---|---|---|
| ***AK0*** | ***amplitude marker off*** | ***AK0*** | ***activate/deactivate a function which causes a 3 dB drop in RF output level to occur at marker frequencies*** |
| ***AK1*** | ***amplitude marker on*** | ***AK1*** | |
| ***AM0*** | ***AM off*** | ***AM0*** | ***deactivate amplitude modulation*** |
| ***AM1*** | ***AM ext on*** | ***AM1*** | ***activate external amplitude modulation (rate 1 kHz, depth 50%)*** |
| AM2 | AM int sine on | AM2 | activate internal AM, sine |
| AM3 | AM int square on | AM3 | activate internal AM, square |
| AM4 | AM int tri on | AM4 | activate internal AM, triangle |
| AMF0 | AMF (scan modulation) off | AMF0 | deactivate scan modulation |
| AMF1 | AMF ext on | AMF1 | activate external scan modulation |
| AMF2 | AMF sine on | AMF2 | activate internal scan modulation, sine |
| AMF3 | AMF square on | AMF3 | activate internal scan modulation, square |
| AMF4 | AMF tri on | AMF4 | activate internal scan modulation, triangle |
| AR d t | AM int rate | AR400HZ | set internal AM rate 400 Hz |
| AT d t | set attenuator independently of level control, in 10 dB increments | AT80DB | set attenuator to 80 dB (attenuator must first be uncoupled from level control by means of 'SHSL' command) |
| AU | shortest sweep time | AU | set sweep time to minimum |
| BC | band change | BC | not applicable to Model 7200 |
| CB h | clear bit | (These commands are used for diagnostic purposes only.) | |
| CC0 | freq. correction off | | |
| CC1 | freq. correction on | | |
| CCS d t | cable cal step size (d≥50 MHz; default is 100 MHz) | CCS50MZ | set cable calibration increment to 50 MHz |
| ***CF d t*** | ***AFS center freq*** | ***CF4GZ*** | ***set analog sweep center frequency to 4 GHz*** |
| ***CS*** | ***clear both status bytes*** | ***CS*** | ***clear the 16-bit status bytes used for output status*** |
| ***CW d t*** | ***CW freq*** | ***CW2.4GZ*** | ***set CW frequency to 2.4 GHz*** |
| D1 | FSD continuous | D1 | digital frequency sweep, automatic repetitive |
| D2 | FSD single | D2 | digital frequency sweep, single sweep |
| D3 | FSD manual | D3 | digital frequency sweep, stop sweep & permit incremental adjustment of frequency |

| Remote Programming Commands (7200 Syntax) | | | |
|---|---|---|---|
| **Code** | **Operation** | **Example** | **Notes** |
| *DF d t* | *FSA delta freq* | *DF2GZ* | *analog frequency sweep, set Δ freq. to 2 GHz* |
| *DN* | *down step* | *DN* | *equivalent to pressing [DOWN] button, to decrement the parameter last set* |
| *DU 0* | *display update off* | *DU0* | *blank the front panel display* |
| *DU 1* | *display update on* | *DU1* | *show and update the front panel display* |
| *EF* | *entry display off* | *EF* | *deactivate entry display* |
| *EK* | *enable knob* | *EK* | *allow the front panel digi-dial to be active during remote control operation* |
| *FA d t* | *FSA start freq* | *FA2GZ* | *analog frequency sweep, set start freq. 2 GHz* |
| *FB d t* | *FSA stop freq* | *FA5GZ* | *analog frequency sweep, set stop freq. 5 GHz* |
| FC d t | FSA sweep time | FC100MS | analog freq. sweep, set sweep time 100 ms |
| FD d t | FM deviation | FM2MZ | frequency modulation, set deviation 2 MHz |
| FM 0 | FM off | FM0 | deactivate frequency modulation |
| FM 1 | FM ext on | FM1 | activate external frequency modulation |
| FM 2 | FM int sine on | FM2 | activate internal FM, sine |
| FM 3 | FM int square on | FM3 | activate internal FM, square |
| FM 4 | FM int tri on | FM4 | activate internal FM, triangle |
| FR d t | FM int rate | FR50KZ | set internal FM rate 50 kHz |
| GA d t | FSD start freq | GA1GZ | digital freq. sweep, set start freq. 1 GHz |
| GB d t | FSD stop freq | GB5GZ | digital freq. sweep, set stop freq. 5 GHz |
| GC d t | FSD freq step | GC100MZ | digital freq. sweep, set step size 100 MHz |
| GD d t | FSD dwell time | GD100MS | digital freq. sweep, set dwell time 100 ms |
| GE d t | FSD sweep time | GE1S | digital freq. sweep, set sweep time 1 s |
| GT | Giga-tronics 1026 syntax | GT | select 1026 syntax for remote interface (use 'HP' command to return to 7200 syntax, which emulates 8340) |

| Remote Programming Commands (7200 Syntax) | | | |
|---|---|---|---|
| **Code** | **Operation** | **Example** | **Notes** |
| ***IF*** | ***increment frequency*** | ***IF*** | ***raise CW freq. by minimum resolvable step*** |
| ***IP*** | ***instrument preset*** | ***IP*** | ***simulates pressing [SHIFT] [RESET]*** |
| KK a | virtual keystrokes (front panel) | KK02 | simulates pressing front panel [CW] button (see "keystroke" table for full list of keys) |
| KR | keyboard release | KR | not applicable to Model 7200 |
| LC 0 | level correction off | (This command is used for diagnostic purposes only.) | |
| LC 1 | level correction on | | |
| ***M0*** | ***marker (most recent) off*** | ***M0*** | ***deactivate the marker that was last activated*** |
| ***M1 d t*** | ***marker 1 on*** | ***M12GZ*** | ***activate marker 1; set to 2 GHz*** |
| ***M2 d t*** | ***marker 2 on*** | ***M23GZ*** | ***activate marker 2; set to 3 GHz*** |
| ***M3 d t*** | ***marker 3 on*** | ***M34GZ*** | ***activate marker 3; set to 4 GHz*** |
| ***M4 d t*** | ***marker 4 on*** | ***M45GZ*** | ***activate marker 4; set to 5 GHz*** |
| ***M5 d t*** | ***marker 5 on*** | ***M56GZ*** | ***activate marker 5; set to 6 GHz*** |
| M6 d t | marker 6 on | M67GZ | activate marker 6; set to 7 GHz |
| M7 d t | marker 7 on | M78GZ | activate marker 7; set to 8 GHz |
| M8 d t | marker 8 on | M89GZ | activate marker 8; set to 9 GHz |
| MA h | memory address set | (This command is used for diagnostic purposes only.) | |
| ***MC*** | ***marker to center freq*** | ***MC*** | ***set last selected marker to sweep center freq.*** |
| ***MO*** | ***marker (most recent) off*** | ***MO*** | ***deactivate the marker that was last activated*** |
| MS | ms unit (ignore if cmd) | (This command is not supported.) | |
| NA b | network analyzer cfg | (This command is not supported.) | |
| NM | 'next modulation', FM | NM | toggle between available FM modes |
| NSR | never say remote | NSR | display params., not "remote" message |

## Remote Programming Commands (7200 Syntax)

| Code | Operation | Example | Notes |
|---|---|---|---|
| *"O" etc.* | *output commands (suffixes in parentheses indicate format of output data)* | *listed below* | *send data to controller specifying current parameters, in fundamental units of Hz, dB(m), or seconds.* |
| ***OA (d)*** | ***output active param*** | ***OA*** | ***send parameter that was last changed*** |
| OB (d) | output next band change | (This command is not supported.) | |
| ***OC (d, d, d)*** | ***output coupled params*** | ***OC*** | ***send start freq., center freq., sweep time*** |
| OD (5a) | output diagnostic characters (you must first run self test; see command SHM4) | OD | send 5 diagnostic ASCII chars; each is '0' for unlocked/unleveled or '1' for locked/leveled; chars in order from left represent (1) Output PLL, (2) Reference PLL, (3) Fixed L.O. PLL, (4) 100 MHz PLL, (5) Automatic Level Control |
| OGI | output Giga-tronics identification (not an output command; see notes) | OGI | changes the information sent in response to an 'OI' command (example: 'GT7200 .01-20GHz VER.B134 SN74015 9/1/1993') |
| ***OI (19a)*** | ***output identification*** | ***OI*** | ***send 'HP8340/8341'*** |
| OM (8b) | output mode data | (This command is not supported.) | |
| OPAS (d) | output status string | OPAS | send status string |
| OPCF (d) | output center freq | OPCF | send sweep center frequency |
| OPCW (d) | output CW freq | OPCW | send CW frequency |
| OPDF (d) | output delta freq | OPDF | send sweep delta frequency |
| OPFA (d) | output start freq | OPFA | send sweep start frequency |
| OPFB (d) | output stop freq | OPFB | send sweep stop frequency |
| OPM1 (d) | output mkr 1 freq | OPM1 | send marker 1 frequency |
| OPM2 (d) | output mkr 2 freq | OPM2 | send marker 2 frequency |
| OPM3 (d) | output mkr 3 freq | OPM3 | send marker 3 frequency |
| OPM4 (d) | output mkr 4 freq | OPM4 | send marker 4 frequency |
| OPM5 (d) | output mkr 5 freq | OPM5 | send marker 5 frequency |
| OPM6 (d) | output mkr 6 freq | OPM6 | send marker 6 frequency |
| OPM7 (d) | output mkr 7 freq | OPM7 | send marker 7 frequency |
| OPM8 (d) | output mkr 8 freq | OPM8 | send marker 8 frequency |
| OPPL (d) | output power | OPPL | send output power level |
| OPPO | output power offset | OPPO | send output power offset |
| OPSF (d) | output CW freq step | OPSF | send frequency sweep step size |
| OPTC (d) | output temp cal pmtr | (This command is used for diagnostic purposes only.) | |
| OR (d) | output power level | OR | send output power level |
| OS (2b) | output status bytes | (This command is not supported.) | |

## Remote Programming Commands (7200 Syntax)

| Code | Operation | Example | Notes |
|---|---|---|---|
| P1 | PSA, auto | P1 | analog power sweep, auto. repetitive sweep |
| P2 | PSA, single | P2 | analog power sweep, single sweep |
| P3 | PSA, manual | P3 | analog power sweep: stop sweep & permit incremental adjustment of level |
| PA d t | PSA start power | PA5DM | start analog power sweep at +5 dBm |
| PB d t | PSA stop power | PA10DM | stop analog power sweep at +10 dBm |
| PC d t | PSA sweep time | PC100MS | analog power sweep: set sweep time 100 ms |
| ***PL d t*** | ***power level*** | ***PL-5.1DM*** | ***set output level -5.1 dBm*** |
| ***PM 0*** | ***PM off*** | ***PM0*** | ***pulse modulation off*** |
| ***PM 1*** | ***PM ext + on*** | ***PM1*** | ***external PM, external pulse positive true*** |
| PM 2 | PM int on | PM2 | internal pulse modulation on |
| PM 3 | PM ext - on | PM3 | external PM, external pulse negative true |
| PM 4 | PM trig + on | PM4 | external PM, external rising edge trigger |
| PM 5 | PM trig - on | PM5 | external PM, external falling edge trigger |
| PR d t | PM int rate | PR50KZ | internal pulse mod., set rate 50 kHz |
| ***PS 0*** | ***APS off*** | ***PS0*** | ***deactivate/activate power analog sweep*** |
| ***PS 1*** | ***APS on*** | ***PS1*** | |
| PW d t | PM int width | PW1US | internal pulse mod. width 1 µs |
| PY d t | PM int delay | PY.1US | internal pulse mod. delay .1 µs |
| QA d t | DPS start power | QA2DM | start digital power sweep at 2 dBm |
| QB d t | DPS stop power | QB8DM | stop digital power sweep at 8 dBm |
| QC d t | DPS step size | QC.1DB | digital power sweep step size .1 dB |
| QD d t | DPS dwell time | QD30MS | digital power sweep dwell time 30 ms |
| ***RC n*** | ***recall front panel setup*** | ***RC6*** | ***recall front panel setup, memory location 6*** |
| ***RF 0*** | ***RF off*** | ***RF0*** | ***deactivate/activate RF output*** |
| ***RF 1*** | ***RF on*** | ***RF1*** | |
| RM b | status byte mask | (This command is not supported.) | |
| ***RS*** | ***reset sweep*** | ***RS*** | ***reset sweep*** |
| ***S1*** | ***FSA auto*** | ***S1*** | ***analog freq. sweep, automatic repetitive*** |
| ***S2*** | ***FSA single*** | ***S2*** | ***analog freq. sweep, single sweep*** |

### Remote Programming Commands (7200 Syntax)

| Code | Operation | Example | Notes |
|---|---|---|---|
| ***S3*** | ***FSA manual*** | ***S3*** | ***stop analog freq. sweep & permit incremental adjustment of frequency*** |
| SB h | set bit | (This command is used for diagnostic purposes only.) | |
| SC0 | scan off | SC0 | deactivate, activate scan modulation |
| SC1 | scan on | SC1 | |
| ***SF d t*** | ***CW freq step size*** | ***SF50MZ*** | ***CW frequency step size 50 MHz*** |
| ***SG*** | ***FSA, single sweep*** | ***SG*** | ***analog frequency sweep, single sweep*** |
| SHA1 | unleveled | SHA1 | unleveled mode (disable ALC loop) |
| SHCF d t | freq sweep step size | (This command is not supported.) | |
| ***SHCW d t*** | ***CW resolution increment*** | ***SHCW1KZ*** | ***set CW frequency resolution 1 kHz*** |
| SHM4 | self test | SHM4 | run instrument self test; display results |
| SHM5 | turn off diagnostics | (This command is not supported.) | |
| ***SHPL d t*** | ***set power level step*** | ***SHPL3DB*** | ***set level resolution 3 dB*** |
| SHPM | 8757A mode (ext PM on) | SHPM | activate external pulse modulation (for use with 8757A) |
| SHPS d t | uncouple atten & ALC; set attenuator in 10 dB increments | SHPS40DB | uncouple attenuator from level control; set attenuator to 40 dB |
| SHRF d t | unleveled | SHRF | unleveled mode (disable ALC loop) |
| SHS1 0 | displays not blanked | SHS10 | deactivate/activate blanking of front panel displays |
| SHS1 1 | displays blanked | SHS11 | |
| SHSL d t | uncouple atten & ALC; set attenuator in 10 dB increments | SHSL10DB | uncouple attenuator from level control; set attenuator to 10 dB |
| SM | sweep, manual | SM | stop frequency or power sweep, & permit incremental adjustment of freq. or power |
| SN | start steps | SN | select start/steps mode, with parameters set to last selected state (or to default settings: 2 GHz start freq., 10 steps, 100 MHz step size, 100 ms dwell time) |
| ***SP d t*** | ***power step size*** | ***SP1DB*** | ***set power resolution 1 dB*** |
| ***ST d t*** | ***FSA & PSA sweep time*** | ***ST500MS*** | ***set sweep time 500 ms, analog frequency sweep or analog power sweep*** |
| ***SV n*** | ***save instrument state*** | ***SV4*** | ***store front panel setup, memory location 4*** |

| Remote Programming Commands (7200 Syntax) | | | |
|---|---|---|---|
| **Code** | **Operation** | **Example** | **Notes** |
| ***TS*** | ***FSA single sweep*** | ***TS*** | ***analog frequency sweep, single sweep*** |
| UN 0 | unlocked mode off | UN0 | disable/enable unlocked mode (in unlocked mode, the output phase lock loop is disabled) |
| UN 1 | unlocked mode on | UN1 | |
| ***UP*** | ***up step*** | ***UP*** | ***equivalent to pressing [UP] button, to increment the parameter last set*** |
| WR h | write data | (This command is used for diagnostic purposes only.) | |

### Virtual Keystrokes ( 'KK' Command) in 7200 Syntax

| Code | Key | Shifted Key |
|---|---|---|
| 00 | FREQ | |
| 01 | POWER | |
| 02 | CW | |
| 10 | ANALOG | |
| 11 | STEP/DWELL | |
| 20 | START/STOP | |
| 21 | CTR/DELTA | |
| 22 | START/STEPS | |
| 23 | START/DELTA | |
| 24 | DELTA/MKR | |
| 30 | AUTO | |
| 31 | SINGLE | |
| 32 | EXT | |
| 33 | STOP/RESET | |
| 40 | LEVEL | |
| 50 | PM | |
| 51 | AM | |
| 52 | FM | NARROW |
| 60 | ALL OFF | MX ⇒ CF |
| 61 | AMPL | MX - MY |
| 62 | PROG | |
| ***63*** | ***MKR1*** | |
| 70 | RECALL | STORE |
| 80 | RF ON/OFF | |
| 81 | ENTRY | |
| 82 | SHIFT | |
| 90 | OFF | |
| 91 | ON | |
| 92 | MODE | |
| 93 | SCROLL | |
| ***94*** | ***MODE 0*** | |
| ***95*** | ***SCROLL 0*** | |
| A0 | UP | |
| A1 | DOWN | |
| C0 | RESOLUTION | |
| D0 | 0 | RESET |
| D1 | 1 | TEST |
| D2 | 2 | ATTEN |
| D3 | 3 | ALT |
| D4 | 4 | OFFSET |
| D5 | 5 | MULT |
| D6 | 6 | ALC |
| D7 | 7 | SPECIAL |
| D8 | 8 | |
| D9 | 9 | |
| DA | DOT | LOCAL |
| DB | MINUS | ADRS |
| DC | GHz/ns/dBm | |
| DD | MHz/μs | |
| DE | kHz/ms | |
| DF | Hz/s/% | |

These commands simulate pressing keys on the instrument's front panel. Command sequences must begin with 'KK'. Codes intended to represent shifted keys must be preceded by the code '82'. Sample command sequence: 'KK 82 D0 02 D2 DC' is equivalent to pressing [SHIFT] [0] ("reset") [CW] [2] [GHz/dBm]; this sequence resets the instrument and sets a CW frequency of 2 GHz.

Key functions shown in italics are pseudo-keys; they do not represent actual front panel keys, but they are needed to insure that certain front panel functions (markers, scroll, and mode) are reset to their initial state before other keystrokes modify them.

### 2.16.5 Remote Programming, IEEE-488 Interface, 1026 Syntax

In addition to the default '7200' syntax, Model 7200 can also be remotely controlled using the '1026' syntax (Giga-tronics 1026 emulation), as described below. This syntax is selected by sending the command 'GT' (the 'HP' command is used to return to the 7200 syntax).

*CHARACTER REPRESENTATION*

Command names are represented in capital letters. Small letters are used for special characters, as shown in the table below:

| ***Shown as*** | ***Interpreted as*** |
|---|---|
| (cr) | carriage return |
| (lf) | line feed |
| s | one space |
| z | zero or more spaces |
| b | one or more spaces |
| a | alphabetic character |
| d | one decimal digit |
| n | numeric argument (see below) |

*COMMAND FORMAT*

The standard command format consists of a verb, followed by zero or more spaces, followed by an argument. In the command 'GENzFIXED', GEN is the verb and FIXED is the argument. In a few cases, the argument is omitted (the 'HP' command, for example).

Sometimes the argument consists of a number. In the command 'FAz12.3E+3', FA is the verb and 12.3E+3 is the argument.

Numeric arguments are used in the frequency and level setting commands, and are represented in command descriptions by a lower case 'n'. The format for numeric arguments is sufficiently flexible that no special formatting will be needed when using most IEEE-488 controllers. Signed or unsigned numbers are acceptable. Integers or decimal fractions are permitted and may be followed by a signed or unsigned one or two digit exponent. Leading zeroes are permitted, but spaces within a number are not permitted. The integer and optional fractional part are each restricted to a maximum length of 10 digits. The following are examples of valid numeric arguments:

| ***Entered as*** | ***Interpreted as*** |
|---|---|
| _25.7 | 25.7 |
| _7_ | 7 |
| -32.1 | -32.1 |
| 2.6E-6 | $2.6 \times 10^{-6}$ |
| 6E-10 | $6 \times 10^{-10}$ |
| -000.145E+9 | $-0.145 \times 10^{9}$ |
| 1E6 | $1 \times 10^{6}$ |

## *COMMANDS*

In the tables which follow, the remote commands used in the '1026' syntax are listed and described. In the case of a command requiring a numeric argument, the acceptable range of values is determined by the specifications of the instrument; for example, it is not permitted to specify a frequency outside of the range of the instrument.

***Remote Programming Commands (1026 Syntax)***

| ***Command*** | ***Description*** |
|---|---|
| AC0 | disable AM correction |
| AC1 | enable AM correction |
| AF0 | fast always off |
| AF1 | fast always on |
| DISP0 | displays off |
| DISP1 | displays on |
| EXTALCzOFF | disable external automatic level control |
| EXTALCzON | enable external automatic level control |
| FAzn | set FA (CW freq. or sweep start freq.) to 'n' MHz |
| FBzn | set FB (sweep stop freq.) to 'n' MHz |
| FCzn | set FC (sweep step size) to 'n' MHz |
| GENzASWP | generate analog sweep from FA to FB |
| GENzCSWP | generate analog sweep centered on FC; Δ = FB |
| GENzFIXED | generate fixed (CW) frequency |
| GENzLSWP | generate locked frequency sweep (step/dwell mode) |
| GENzMSWP | generate analog sweep between markers (from MA to MC) |
| HP | select '7200' syntax (use 'GT' command to return to the present syntax) |
| LC0 | level correction off |
| LC1 | level correction on |
| LEVELzn | set output level to 'n' dBm (entry resolution .1 dB) |
| LVLCRSzn | set attenuator to 'n' dB, independently of leveling loop (entry resolution: 10 dB steps); output level is the sum of LVLCRS & LVLFNE arguments |
| LVLFNEzn | set leveling loop to 'n' dB, independently of attenuator (entry resolution: .1 dB); output level is the sum of LVLCRS & LVLFNE arguments |

| Remote Programming Commands (1026 Syntax) | |
|---|---|
| **Command** | **Description** |
| MAzn | set first marker frequency to 'n' MHz |
| MBzn | set second marker frequency to 'n' MHz |
| MCzn | set third marker frequency to 'n' MHz |
| MODzAM | external amplitude modulation |
| MODzCONTzOFF | AM/scan modulation off |
| MODzCONTzSCAN | scan modulation on |
| MODzCONTzAM | external AM on |
| MODzDESCRzEXT+ | external pulse modulation, rising-edge triggered |
| MODzDESCRzEXT- | external pulse modulation, falling-edge triggered |
| MODzDESCRzOFF | pulse modulation off |
| MODzDESCRzPULSE | internal pulse modulation |
| MODzDESCRzSQR | internal pulse modulation, 50% duty cycle |
| MODzEXT+ | external pulse modulation, positive trigger |
| MODzEXT- | external pulse modulation, negative trigger |
| MODzOFF | modulation off |
| MODzPULSE | internal pulse modulation, 1 kHz rate, 1 μs width |
| MODzSQR | internal square wave modulation, 1kHz rate |
| NSR | never say remote (display parameters, not "remote" message) |
| POWERzINT | measure internal power |
| PULSEzEXT | external pulse modulation, positive trigger |
| PULSEzOFF | pulse modulation off |
| SENDzFREQ | send data to controller, specifying current output frequency |
| SENDzPOWER | send data to controller, specifying current output power |
| SENDzSTATUS | send data to controller, specifying current lock and level status |

| Remote Programming Commands (1026 Syntax) | |
|---|---|
| **Command** | **Description** |
| SWEEPzAUTO | frequency sweep mode: automatic repetitive sweep |
| SWEEPzONCE | frequency sweep mode: single sweep |
| SWEEPzRATEza | select sweep rate ‘a’; available rates are as follows: A = 10 ms, B = 20 ms, C = 50 ms, D = 100 ms, E = 200 ms, F = 500 ms, G = 1000 ms, H = 2000 ms, I = 5000 ms, J = 10000 ms. |
| SWEEPzRESET | reset sweep |
| SWEEPzSTEP | increment output frequency by one step (step size is defined by FC) |
| SWEEPzSTPzTRIG | increment output frequency by one step upon receipt of trigger input (step size is defined by FC) |
| SWEEPzTRIG | frequency sweep mode: triggered single sweep |
| UNz1 | unlocked mode on |

## 2.17 HP 8757 INTERFACE

To operate the instrument in conjunction with the HP 8757 Scalar Network Analyzer, follow these instructions:

1. Connect the 7200's 'BLANK/$\overline{\text{MKR}}$' BNC to the 8757's 'POS Z BLANK' BNC.
2. Connect the 7200's 'RAMP OUT' BNC to the 8757's 'SWEEP IN 0-10 V'.
3. Connect the 7200's 'PM IN' BNC to the 8757 'MODULATION DRIVE'.
4. **DO NOT** connect the 7200's 'STOP SWP I/O' BNC to the 8757.
5. Connect an IEEE cable from the 7200's 'REMOTE' connector to the 8757 'SYSTEM INTERFACE' (the 'source' address for the 8757 must match the address of the 7200).
6. Press **[SHIFT] [0]** on the 7200 to reset it.
7. Verify that the 8757 is set to talk to the 7200 at the 7200's IEEE address. This can be checked under the 8757 **[LOCAL]** button menu (it is called 'sweeper address'). Alternatively, 7200's address can be changed to match the sweeper address for the 8757: press **[SHIFT] [ADRS]** on the 7200's front panel, enter the 8757's source address, then press any of the units keys.
8. Verify that the 7200 is set to '7200' GPIB syntax, using special function 40. Press **[SHIFT] [SPECIAL]**, enter '40' at the prompt; press the **[ON]** button to activate this syntax if it is off.
9. Press **[PRESET]** on the 8757.
10. The units should now be in interface mode.

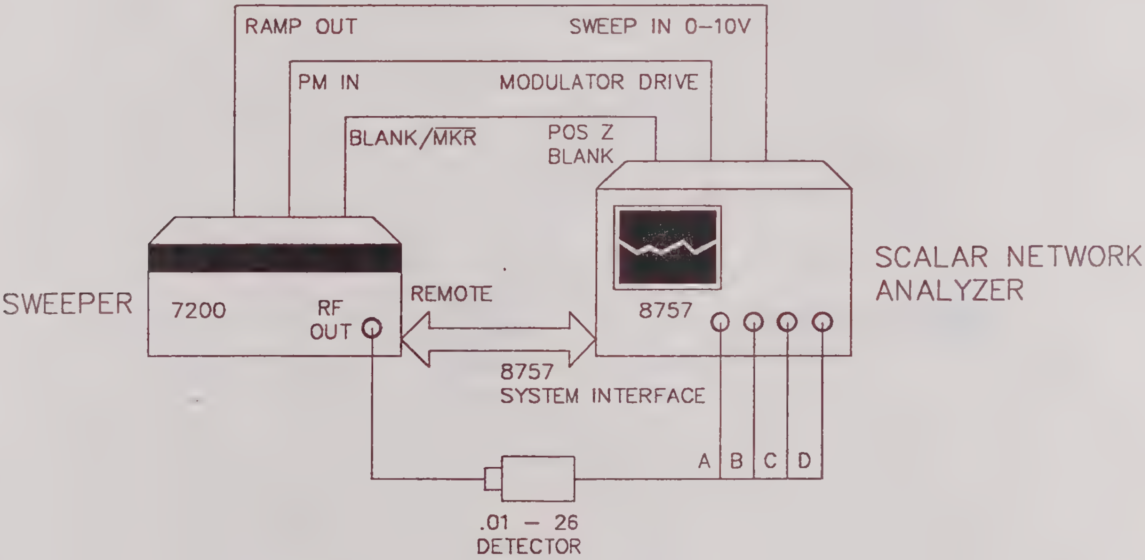

RAMP OUT
SWEEP IN 0–10V
PM IN
MODULATOR DRIVE
BLANK/MKR
POS Z BLANK
SWEEPER
7200
RF OUT
REMOTE
8757
SCALAR NETWORK ANALYZER
8757 SYSTEM INTERFACE
A
B
C
D
.01 – 26 DETECTOR

*Figure 2.13: 7200 to 8757 connection*

## 2.18 GIGA-TRONICS 8003 INTERFACE

To operate the instrument in conjunction with the Giga-tronics 8003 Scalar Analyzer, follow these instructions:

1. Connect the 7200's 'BLANK/$\overline{\text{MKR}}$' BNC to the 8003's 'BLANKING INPUT' BNC.
2. Connect the 7200's 'RAMP OUT' BNC to the 8003's 'SWEEP IN' BNC.
3. Connect the 7200's 'PM IN' BNC to the 8003's 'AC MOD OUTPUT'.
4. Connect an IEEE cable from the 7200's 'REMOTE' connector to the 8003 'GPIB/PRIVATE BUS' connector (*not* the 'GPIB/SYSTEM' connector). The 'source' address for the 8003 must match the address of the 7200.
5. Press **[SHIFT] [0]** on the 7200 to reset it.
6. Verify that the 8003 is set to talk to the 7200 at the 7200's IEEE address. This can be checked under the 8003's CONFIG menu: press 'CONFIG'; press 'GPIB DEVICES'; press 'PVT BUS ON/OFF' to activate the private bus; press 'SOURCE'; enter the remote address to which the 7200 has been set, and press 'GIGA-TRONICS' if the menu includes that option. Alternatively, the 7200's address can be changed to match the source address for the 8003: press **[SHIFT] [ADRS]** on the 7200's front panel, enter the 8003's source address, then press any of the units keys.
7. Verify that the 7200 is set to the '7200' GPIB syntax, using special function 40. Press **[SHIFT] [SPECIAL]**, enter '40' at the prompt; press the **[ON]** button to activate this syntax if it is off.
8. Press **[PRESET]** on the 8003; press **[CONFIRM PRESET]** on the 8003.
9. After an interconnection delay, the units should be in interface mode.

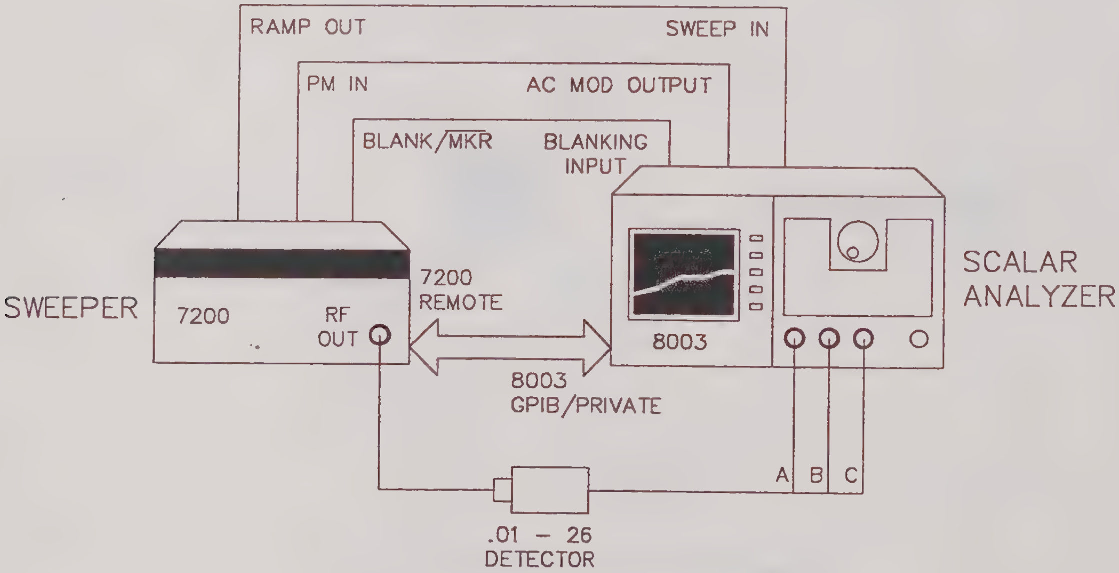

RAMP OUT
SWEEP IN
PM IN
AC MOD OUTPUT
BLANK/$\overline{\text{MKR}}$
BLANKING INPUT
SWEEPER
7200
RF OUT
7200 REMOTE
8003
SCALAR ANALYZER
8003 GPIB/PRIVATE
A
B
C
.01 – 26 DETECTOR

*Figure 2.14: 7200 to 8003 connection*

# 3 Theory of Operation

## 3.1 THE COMPUTER

Model 7200 is controlled by an internal microcomputer which is based on the 68000 microprocessor, running at 8 MHz. The microprocessor controls, and communicates with, other circuits by means of a data bus system and a series of latches. This system, along with the various memory devices, will be referred to collectively as the computer.

The standard memory package includes a memory board and front panel interface board holding 128K of RAM and 256K of ROM, with sockets providing room for memory expansion. A 32K "config" ROM is programmed with initialization data, correction data for the leveling control system, and other information unique to the individual instrument. A 32K non-volatile RAM is used for storage of control settings and cable calibration data.

The computer generates and receives digital information required for operation of almost every instrument function. It receives and interprets the operator's commands, through either the front panel pushbuttons or the remote interface; it returns information to the operator, through either the front panel displays or the remote interface; it selects appropriate reference frequencies and intermediate frequencies in order to generate the RF output; it activates the appropriate YIG oscillators and tunes them; it selects appropriate filter lines, detectors and RF paths for a given frequency; it controls the power level and modulation of the output; it monitors the functioning of the instrument and supplies error messages and fault indications to the operator.

## 3.2 FREQUENCY SYNTHESIS

### 3.2.1 Phase Lock Loops

The purpose of a phase lock loop is to control the frequency of a variable oscillator in order to give it the same accuracy and stability as a fixed reference oscillator. It works by comparing two frequency inputs, one fixed and one variable, and supplying a correction signal to the variable oscillator to reduce the difference between the two inputs. For example, suppose that we have a 10 MHz source with a stability of $1 \times 10^{-6}$/year, and we wish to transfer that stability to a voltage controlled oscillator (VCO). The 10 MHz source is applied to the reference input of a phase lock loop circuit. The signal from the VCO is applied to the variable input. A phase detector in the PLL compares the two inputs and determines whether the variable input waveform is leading or lagging the reference. The phase detector has two outputs; pulses will appear at one of them (which one depends on whether the variable is leading or lagging), and the width of the pulses is proportional to the degree of phase difference. The pulses are averaged by a low pass filter and DC amplifier into a correction signal which (depending on polarity) causes the VCO to increase or decrease in frequency in order to reduce the phase difference. When the two inputs match, the loop is said to be "locked", and the variable input from the VCO then equals the reference input in phase, frequency, accuracy and stability.

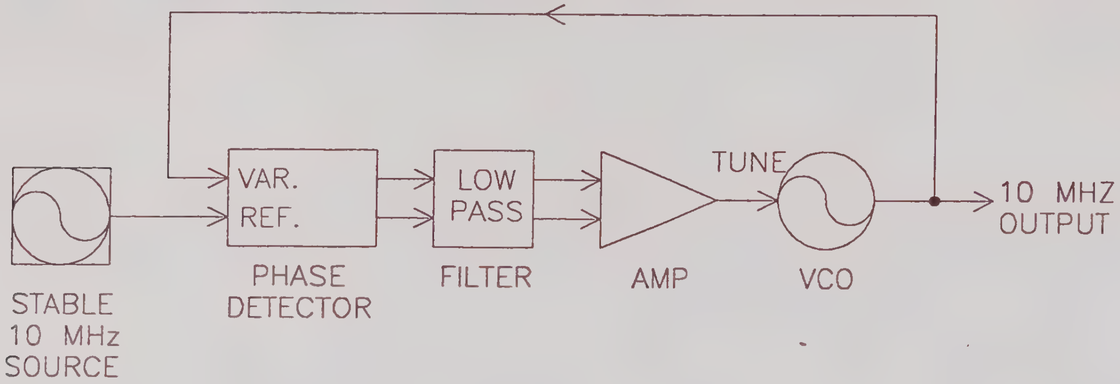


***Figure 3.1: Phase lock loop circuit***

The preceding description implies that the two oscillators must be of equal frequency, but that is not the case in practical applications. Usually, a prescaler (that is, a frequency divider) is introduced between the output of the variable oscillator and the variable input to the PLL. The circuit can then be used to control a frequency that is an exact multiple of the reference. If a divide-by-two circuit is used, the variable oscillator can be twice the frequency of the reference and still be phase locked to it; the variable oscillator acquires the stability of the reference without equalling its frequency. A 100 MHz VCO can be controlled by a PLL using a 10 MHz reference, provided a divide-by-ten circuit intervenes between the VCO's output and the variable input to the PLL. Then both inputs to the phase detector will be 10 MHz when the loop is locked.

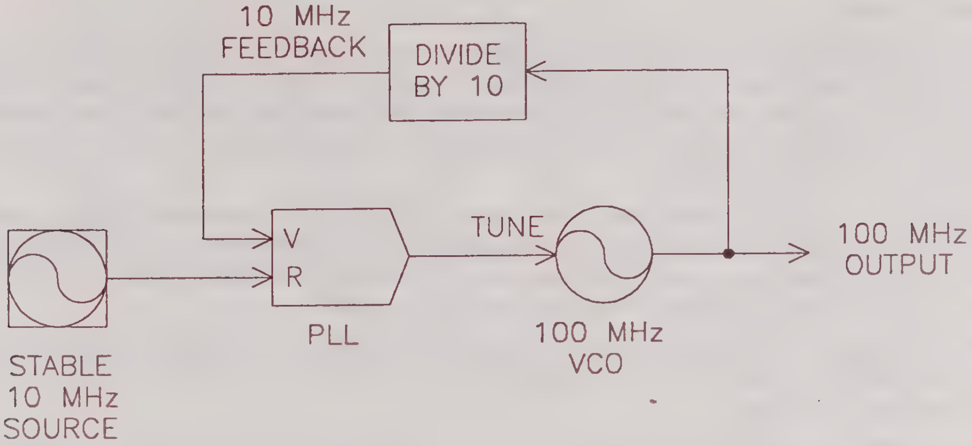


*Figure 3.2: Phase lock loop circuit, with prescaler.*

If the prescaler is a programmable divider, a number of different frequencies can be phase-locked to the same reference, with the limitation that all must be exact multiples of that reference. One of the PLLs employed in this instrument, for example, has a "divide-by-N" circuit that can be programmed with 300 different integer divisors; therefore it can phase-lock 300 different frequencies to the same reference.

The phase lock loops used in Giga-tronics instruments employ integrated circuit phase detectors, with external filter components and amplifiers designed to minimize the sidebands which the output pulses of the phase detector tend to contribute to the variable frequency.

### 3.2.2 Dual-Loop Synthesis

The output of a synthesized signal generator is phase-locked to a stable reference signal, such as that produced by a crystal oscillator, in order to give the generator output the stability and accuracy of the reference. This can be difficult to achieve, however, in broad-band generators.

In order to produce stable, spectrally pure frequencies over a wide frequency range, Giga-tronics employs a dual-loop synthesis technique. The two loops are (1) the output loop, which phase-locks the synthesizer output frequency to a reference frequency, and (2) the reference loop, which phase-locks the reference frequency to the timebase. The timebase or "master reference" is a highly stable 10 MHz source built into the instrument; an external source can be easily substituted for it at the option of the user.

### 3.2.3 The Output Loop

Depending on the range of the instrument, up to three fundamental YIG oscillators are needed to generate the RF output. The ranges of the individual YIGs are 2-8 GHz, 8-20 GHz and 20-26 GHz. Frequencies below 2 GHz are produced by downconversion (mixing the outputs of two oscillators to obtain an intermediate frequency). The frequency of a YIG oscillator is controlled by means of (1) its tuning coil and (2) its FM coil.

The tuning coil is used for coarse tuning under the direct control of the computer. The computer sends digital data to the YIG driver circuit, where a digital-to-analog converter and an amplifier turn this data into a controlled current supply to the YIG tuning coil. In this way the oscillator can be tuned to within about 10 MHz of the desired output frequency.

The FM coil is used for fine tuning of the oscillator under the control of the output phase lock loop circuit. The output PLL controls the current through the FM coil in order to phase-lock the YIG to the PLL reference frequency.

When the operator selects an output frequency, the computer selects the appropriate YIG oscillator and (using the tuning coil) coarse-tunes it to within about 10 MHz of the desired output. The signal produced by this YIG will, at some point in the instrument's RF path, pass through a coupler which will return a sample of it to the reference mixer.

The other input to the reference mixer is not generated within the output loop; it comes from the reference loop, and is generated by the 1.9-8.7 GHz YIG (the reference YIG). This reference frequency is selected by the computer, and is 95 to 395 MHz lower than the frequency of the output YIG. The IF output of the reference mixer is equal to this difference between reference and output frequencies (in other words, the IF output has a range of 95 to 395 MHz).

The output loop requires a 1 MHz signal from the divide-by-N circuit regardless of the output frequency, because the output loop's phase detector compares the output of the divide-by-N with a timebase-derived 1 MHz reference. Therefore, the divide-by-N must be programmed so as to divide the mixer IF down to 1 MHz (the range of divisors for this circuit is 95 to 395). The divisor ("N") selected by the computer is equal to the mixer IF, in MHz. If the mixer IF is 195 MHz, "N" is set to 195. The 195 MHz IF is divided by 195 and a 1 MHz quotient results. The output PLL then compares its two 1 MHz inputs, and adjusts the current in the FM coil of the output YIG oscillator in order to achieve and maintain phase lock.

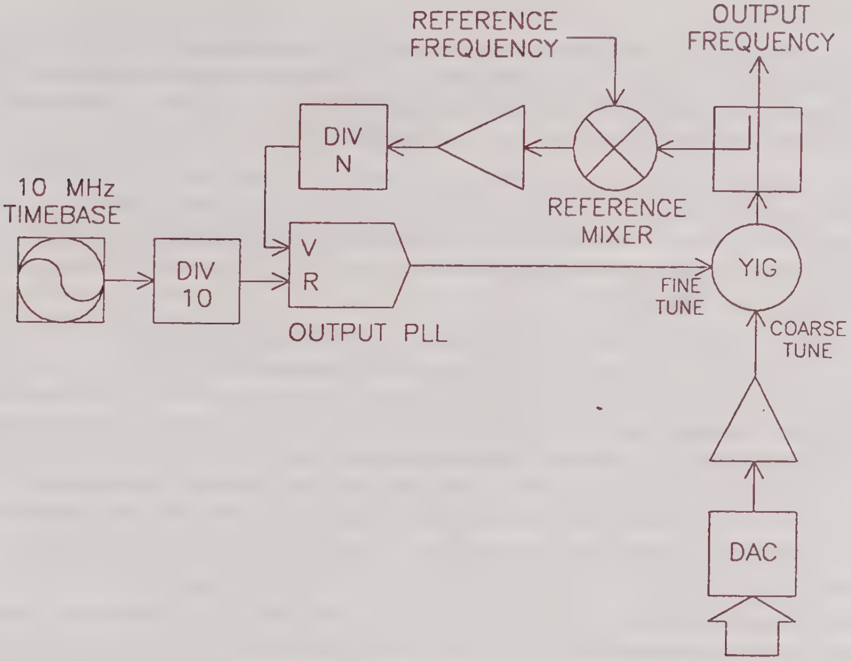


*Figure 3.3: The output loop*

For example, if the user requests a 3000 MHz RF output, the computer selects the 2-8 YIG and tunes it to 3000 MHz, but only roughly (the YIG could, at this point, be generating 2994 or 3003 MHz, for example). At the same time, the computer selects the appropriate reference frequency (in this case 2905 MHz) and the appropriate divisor for the divide-by-N circuit (in this case 95, since there is a 95 MHz difference between the two loops).

A sample of the output frequency is furnished to the reference mixer by means of a coupler in the RF path. The other input to the mixer is the 2905 MHz reference frequency. The mixer produces an IF equal to the difference between the reference and output frequencies. The divide-by-N circuit, as programmed by the computer, divides this IF by 95 and supplies the result to the output phase lock loop.

However, since the output oscillator is not tuned to precisely 3000 MHz, the two loops will not be precisely 95 MHz apart, the mixer IF will not be precisely 95 MHz, and the result of dividing the IF by 95 will NOT be precisely 1 MHz. The output phase lock loop must correct the error.

Comparing the rough 1 MHz signal from the divide-by-N circuit to an exact 1 MHz signal (derived from the timebase), the output PLL determines whether the mixer IF, and therefore the output loop (since the reference loop is assumed to be correct) is too high or too low in frequency, and sends to the output YIG's FM coil whatever correction is needed to reduce the error. In this way the output frequency can be fine-tuned to 3000 MHz, with the result that the mixer IF becomes precisely 95 MHz, the divide-by-N (programmed with a divisor of 95) supplies a precise 1 MHz input to the output PLL, and phase lock is achieved.

### 3.2.4 The Reference Loop

The operation of the output loop requires a stable reference frequency that is relatively close to the RF output frequency (the limitations of the divide-by-N circuit demand that the difference between the two loops be no greater than 395 MHz). Therefore, the reference loop must accomplish the task of generating a broad range of frequencies and locking them to the timebase.

The heart of the reference loop is the step recovery diode multiplier, which is located within the sampling mixer module. This circuit generates multiple harmonics of the signal that is applied to it by the 100 MHz VCXO. Even frequencies as high as 8700 MHz (the 87th harmonic) are generated at useful amplitudes; this permits mixing of the desired harmonic with the microwave signal produced by the reference oscillator.

Since these harmonics generated by the multiplier are all based on the 100 MHz VCXO, they have the same stability as the VCXO. Since the 100 MHz VCXO is phase-locked to the master reference, these harmonics have the same stability as the master reference. The 100 MHz VCXO is controlled by the 100 MHz PLL circuit, which compares the 10 MHz master reference to the output of the VCXO (suitably divided by ten) and sends a correction signal to the VCXO to maintain phase lock. The harmonics generated by the multiplier thus have not only the stability and accuracy of the master reference, but also the superior phase noise characteristics of the VCXO. By phase-locking the reference loop to one of the harmonics, it is possible to impart these desirable characteristics to the reference frequency as well.

The reference frequencies selected by the computer are always slightly offset from a multiple of 100 MHz. This offset is equal to either 5 MHz, or 1.667 MHz (which is 5 MHz divided by three). For example, a reference frequency of 2705 MHz is the 27th harmonic of 100 MHz, plus an offset of 5 MHz; the sampler would mix 2705 MHz with 2700 MHz (the 27th harmonic of 100 MHz) to yield a 5 MHz IF. If the reference frequency were 7601.667 MHz, the sampler would mix it with

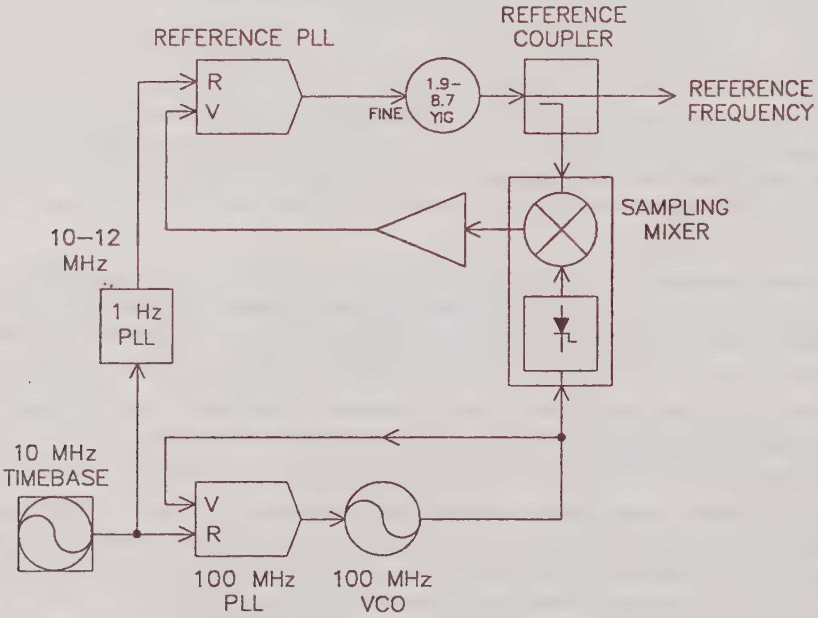


*Figure 3.4: The reference loop*

7600 MHz to yield a 1.667 MHz IF. The 5 MHz or 1.667 MHz IF (following amplification and filtering) is supplied to the reference phase lock loop, which compares the IF to a timebase-derived reference input and sends to the reference YIG's FM coil whatever correction signal is needed to maintain phase lock. As with the output YIG's, the 1.9-8.7 Reference YIG has a tuning coil for coarse tuning under the direct control of the computer, and an FM coil for fine tuning under the control of the reference PLL.

The reference loop operates in virtually the same way for any reference frequency. What varies is the harmonic used and the size of the offset (5 MHz or 1.667 MHz). The sampling mixer is not actually capable of choosing harmonics; its IF output includes many intermodulation products, but these higher frequencies are excluded by a low-pass filter on the sampling mixer output. Only an IF in the desired range can pass through to the phase detector of the reference loop.

The timebase-derived input to the reference PLL is a 10-12 MHz input, received from the 1 Hz PLL. The 1 Hz PLL circuit is a narrow-range synthesizer, which generates a reference frequency, programmable in 2 Hz increments in the range of 10 to 12 MHz. This reference frequency is divided in half on the reference PLL circuit board, resulting in a 5-6 MHz input to the reference loop with a 1 Hz resolution. By offsetting that loop's reference input slightly from 5 MHz, the computer is able to make high-resolution adjustments to the instrument's output frequency.

The choice of a 5 MHz or 1.667 MHz offset is determined by the output frequency. The 1.667 MHz offset is used when the frequency of the output oscillator exceeds the range of the reference oscillator. For example, an output frequency of 15000 MHz is well outside the range of the reference oscillator. In this case the reference frequency is set to 4901.667. The third harmonic of that frequency, 14705, is only 295 MHz lower than the output frequency; the reference mixer produces a 295 MHz IF based on the difference between the output frequency and the third harmonic of the reference frequency. This kind of third-harmonic mixing is required at output frequencies above 7999 MHz and below 2000 MHz. It has no effect on the reference loop, except that the 10-12 MHz reference input from the 1 Hz PLL must be divided differently in order to provide a 1.667 MHz reference to the reference PLL phase detector. Reference frequencies (fREF) for all output frequencies (fOUT) are shown in the following tables.

## OUTPUT & REFERENCE FREQUENCIES
## (all frequencies in MHz)

| fOUT | fREF | fOUT | fREF | fOUT | fREF |
|---|---|---|---|---|---|
| 10-194 | 2601.667 | 4900-4999 | 4805 | 9700-9999 | 3201.667 |
| 195-494 | 2701.667 | 5000-5099 | 4905 | 10000-10299 | 3301.667 |
| 495-794 | 2801.667 | 5100-5199 | 5005 | 10300-10599 | 3401.667 |
| 795-1094 | 2901.667 | 5200-5299 | 5105 | 10600-10899 | 3501.667 |
| 1095-1394 | 3001.667 | 5300-5399 | 5205 | 10900-11199 | 3601.667 |
| 1395-1694 | 3101.667 | 5400-5499 | 5305 | 11200-11499 | 3701.667 |
| 1695-1994 | 3201.667 | 5500-5599 | 5405 | 11500-11799 | 3801.667 |
| 1995-1999 | 3301.667 | 5600-5699 | 5505 | 11800-12099 | 3901.667 |
| 2000-2099 | 1905 | 5700-5799 | 5605 | 12100-11499 | 3701.667 |
| 2100-2199 | 2005 | 5800-5899 | 5705 | 11500-11799 | 3801.667 |
| 2200-2299 | 2105 | 5900-5999 | 5805 | 11800-12099 | 3901.667 |
| 2300-2399 | 2205 | 6000-6099 | 5905 | 12100-12399 | 4001.667 |
| 2400-2499 | 2305 | 6100-6199 | 6005 | 12400-12699 | 4101.667 |
| 2500-2599 | 2405 | 6200-6299 | 6105 | 12700-12999 | 4201.667 |
| 2600-2699 | 2505 | 6300-6399 | 6205 | 13000-13299 | 4301.667 |
| 2700-2799 | 2605 | 6400-6499 | 6305 | 13600-13899 | 4501.667 |
| 2800-2899 | 2705 | 6500-6599 | 6405 | 13900-14199 | 4601.667 |
| 2900-2999 | 2805 | 6600-6699 | 6505 | 14200-14499 | 4701.667 |
| 3000-3099 | 2905 | 6700-6799 | 6605 | 14500-14799 | 4801.667 |
| 3100-3199 | 3005 | 6800-6899 | 6705 | 14800-15099 | 4901.667 |
| 3200-3299 | 3105 | 6900-6999 | 6805 | 15100-15399 | 5001.667 |
| 3300-3399 | 3205 | 7000-7099 | 6905 | 15400-15699 | 5101.667 |
| 3400-3499 | 3305 | 7100-7199 | 7005 | 15700-15999 | 5201.667 |
| 3500-3599 | 3405 | 7200-7299 | 7105 | 16000-16299 | 5301.667 |
| 3600-3699 | 3505 | 7200-7399 | 7205 | 16300-16599 | 5401.667 |
| 3700-3799 | 3605 | 7400-7499 | 7305 | 16600-16899 | 5501.667 |
| 3800-3899 | 3705 | 7500-7599 | 7405 | 16900-17199 | 5601.667 |
| 3900-3999 | 3805 | 7600-7699 | 7505 | 17200-17499 | 5701.667 |
| 4000-4099 | 3905 | 7700-7799 | 7605 | 17500-17799 | 5801.667 |
| 4100-4199 | 4005 | 7800-7899 | 7705 | 17800-18099 | 5901.667 |
| 4200-4299 | 4105 | 7900-7999 | 7805 | 18100-18399 | 6001.667 |
| 4300-4399 | 4205 | 8000-8199 | 2601.667 | 18400-18699 | 6201.667 |
| 4400-4499 | 4305 | 8200-8499 | 2701.667 | 18700-18999 | 6201.667 |
| 4500-4599 | 4405 | 8500-8799 | 2801.667 | 19000-19299 | 6301.667 |
| 4600-4699 | 4505 | 8800-9099 | 2901.667 | 19300-19599 | 6401.667 |
| 4700-4799 | 4605 | 9100-9399 | 3001.667 | 19600-19899 | 6501.667 |
| 4800-4899 | 4705 | 9400-9699 | 3101.667 | 19900-19999 | 6601.667 |

For output frequencies above 20 GHz, reference frequencies are differently determined for different instruments, depending on the upper limit of the output frequency range. Reference frequencies for the different ranges are shown in the tables below.

For instruments to 26.5 GHz, the range above 20 GHz is generated by a 20-26 YIG oscillator. The reference frequencies are shown in the table below.

***OUTPUT & REFERENCE FREQUENCIES IN MHz***
***(instruments to 26.5 GHz)***

| fOUT | fREF | fOUT | fREF | fOUT | fREF |
|---|---|---|---|---|---|
| 20000-20199 | 6601.667 | 22000-22299 | 7301.667 | 24100-24699 | 8101.667 |
| 20200-20499 | 6701.667 | 22300-22599 | 7401.667 | 24700-24999 | 8201.667 |
| 20500-20799 | 6801.667 | 22600-22899 | 7501.667 | 25000-25299 | 8301.667 |
| 20800-21099 | 6901.667 | 22900-23199 | 7601.667 | 25300-25599 | 8401.667 |
| 21100-21399 | 7001.667 | 23200-23499 | 7701.667 | 25600-25899 | 8501.667 |
| 21400-21699 | 7101.667 | 23500-23799 | 7801.667 | 25900-26199 | 8601.667 |
| 21700-21999 | 7201.667 | 23800-24099 | 7901.667 | 26200-26500 | 8601.667 |

For instruments to 40 GHz, the range above 20 GHz is generated by harmonic doubling of the 8-20 YIG oscillator. Reference frequencies are shown in the table below.

***OUTPUT & REFERENCE FREQUENCIES IN MHz***
***(instruments to 40 GHz)***

| fOUT | fREF | fOUT | fREF | fOUT | fREF |
|---|---|---|---|---|---|
| 20000-20599 | 3301.667 | 27800-28399 | 4701.667 | 35600-36199 | 5901.667 |
| 20600-21999 | 3401.667 | 28400-28999 | 4801.667 | 36200-36799 | 6001.667 |
| 21200-21799 | 3501.667 | 29000-29599 | 4901.667 | 36800-37399 | 6101.667 |
| 21800-22399 | 3601.667 | 30200-30799 | 5001.667 | 37400-37999 | 6201.667 |
| 22400-22999 | 3701.667 | 30800-31399 | 5101.667 | 38000-38599 | 6301.667 |
| 23000-23599 | 3801.667 | 31400-31999 | 5201.667 | 38600-39199 | 6401.667 |
| 23600-24199 | 3901.667 | 32000-32599 | 5301.667 | 39200-39799 | 6501.667 |
| 24200-24799 | 4001.667 | 32600-33199 | 5401.667 | 39800-40000 | 6601.667 |
| 24800-25399 | 4101.667 | 33200-33799 | 5501.667 | | |
| 25400-26000 | 4201.667 | 33800-34399 | 5601.667 | | |
| 26000-26599 | 4301.667 | 34400-34999 | 5701.667 | | |
| 26600-27199 | 4401.667 | 35000-35599 | 5801.667 | | |

### 3.2.5 The Downconverter

Frequencies below 2000 MHz are generated by mixing the outputs of two YIG oscillators. The 2-8 YIG provides a fixed 8005 MHz RF input to the downconverter mixer. The 8-20 YIG provides a variable LO input to the same mixer. The IF produced by the mixer (which is equal to the difference between these two inputs) is amplified and filtered in the downconverter module. Since two output oscillators are used simultaneously, there arises the problem of phase-locking both of them with only one output phase lock loop circuit. Therefore, an extra PLL circuit is added to the instrument. This is the Downconverter PLL circuit, which employs a sampling mixer identical to that in the reference PLL; it mixes the 8005 MHz fixed RF with the 80th harmonic of 100 MHz (8000 MHz) to yield a 5 MHz IF. This IF is supplied to the phase detector of the PLL and compared to a timebase-derived 5 MHz reference. The PLL circuit adjusts the frequency of the 2-8 YIG in order to achieve and maintain phase lock. Note that, for frequencies below 2 GHz, the 2-8 YIG is fine-tuned by the Downconverter PLL, while for frequencies from 2 to 8 GHz, it is fine-tuned by the output PLL.

Since the 8005 MHz fixed RF is provided with its own PLL circuit, the output PLL is free for use by the 8-20 YIG. During operation in the downconverter range, the 8-20 YIG is controlled by the output PLL in the same way the output YIG would be during operation in the higher frequency ranges; the only real difference is that the frequency of the output loop and the actual output frequency of the instrument are not the same.

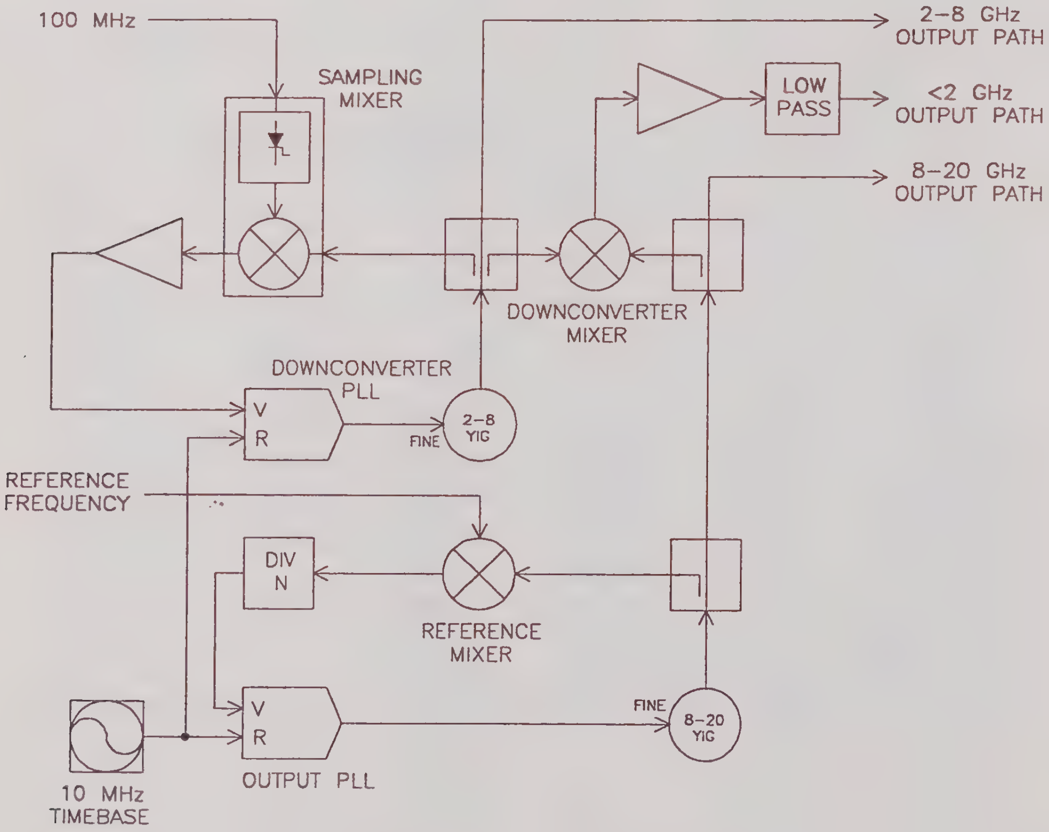

100 MHz
SAMPLING MIXER
2-8 GHz OUTPUT PATH
LOW PASS
<2 GHz OUTPUT PATH
8-20 GHz OUTPUT PATH
DOWNCONVERTER MIXER
DOWNCONVERTER PLL
V
R
FINE
2-8 YIG
REFERENCE FREQUENCY
DIV N
REFERENCE MIXER
V
R
FINE
8-20 YIG
OUTPUT PLL
10 MHz TIMEBASE

*Figure 3.5: The downconverter*

### 3.2.6 Frequencies To 40 GHz

In instruments to 40 GHz, the 20-40 GHz range is generated by the 8-20 GHz YIG oscillator, in combination with a harmonic multiplier in the output path. The 8-20 YIG is tuned and phase-locked as if the output frequency were half of its actual value. For example, in order to generate an output frequency of 32 GHz, the 8-20 YIG is tuned and phase-locked to 16 GHz.

## 3.3 THE RF PATH

The path of transmission between the output of the fundamental YIG oscillator and the output of the instrument includes circuits which perform such functions as RF coupling, modulation, leveling, switching and filtering. It is important to simplify this RF path as much as possible, because power is inevitably lost at interconnections. Giga-tronics cuts this loss to a minimum by designing hybrid RF circuits which incorporate several functions into single modules. Each of the output YIG oscillators has amplifiers to provide both an increase in amplitude and isolation of circuits. A combination coupler/leveler/modulator module is used for each ‘band’. This clustering of RF circuits greatly reduces the power loss which occurs at interconnections between circuits. All path switching is performed by PIN diode circuits, rather than by mechanical switches, for increased reliability.

## 3.4 PULSE MODULATION

Pulse modulation is essentially a means of shutting off the output signal for short periods. The modulation "off" pulses are applied to PIN diode switches in the RF modules. During "off" intervals, the particular RF path which is otherwise activated for the present output frequency is temporarily shut down. That is, during the "on" periods one output path is open, and during the "off" periods no output path is open. For frequencies in the downconverter range (below 2 GHz), the modulating pulses are applied to the 2-8 GHz module, shutting down the RF input to the downconverter mixer. For frequencies in the 20-40 GHz range, the pulses are applied to the 8-20 module, shutting down the RF input to the harmonic multiplier.

The very fast rising and falling edges of the modulating pulses are produced by driver circuits in response to a modulation waveform. The modulation waveform can be generated within the instrument, or it can be applied from an external source. The internal modulation source is a pulse generator with variable pulse rate, width and delay. The 10 MHz timebase is used as a reference for the generator, making it very accurate. For the purpose of synchronizing auxiliary instruments, a TTL level modulation waveform output is available, whether the modulation source is internal or external.

## 3.5 LEVEL CONTROL

RF output amplitude is controlled by a combination of fixed-step attenuation and closed-loop leveling. The instrument's RF output stage includes a step attenuator providing up to 110 dB of attenuation in 10 dB steps. Finer control of the output power level is provided by the closed loop leveling system, also referred to as Automatic Level Control or ALC.

The level control system operates something like a phase lock loop; it produces a correction signal based on the difference between a feedback input and a reference input. The feedback input comes from a level coupler/detector in the RF path. The reference input is generated by the computer, based on the requested level setting and on correction data stored in memory. The output correction signal drives a leveler (a variable attenuator circuit), placed in the RF path ahead of the level detector.

The CPU programs a digital-to-analog converter with level data, including correction factors stored in the instrument's level characterization tables, in order to generate a DC reference signal. The DAC output is combined with other correction signals which may be required, depending on the operating mode (these include an amplitude modulation signal, a sweep level correction input for analog frequency sweeping, and a power sweep input for analog power sweeping).

The combined level reference signal must be further corrected for the non-linear response curve of the level detector. This is accomplished by turning the DC reference signal into a 2.5 MHz signal of variable amplitude, which is applied to a reference detector. The combined reference signal is applied to the control input of a balanced modulator on the output of a 2.5 MHz crystal oscillator. The modulator serves as a variable attenuator, controlling the aplitude of the 2.5 MHz output. The modulated 2.5 MHz signal is applied to the reference detector, which is matched to the level detector and is located in the same module. The DC voltage rectified by the reference diode is furnished by a low pass filter and amplifier to the summing junction of the loop amplifier. The output of the actual level detector is also furnished to this summing junction. The combining of the two detector outputs cancels out the effect of detector non-linearity, and also cancels out temperature-related variations (because both detectors have the same thermal characteristics and are located in the same place).

The loop amplifier output drives a PIN diode attenuator circuit (also known as a leveler) in the RF output path, in order to adjust the output level. The loop amplifier drives the leveler in whichever direction will equalize the detector feedback signal and the reference signal.

Two separate level detectors are used for the output ranges below 2 GHz and above 2 GHz, but the same compensation detector is used in both cases. A remote detector or power meter may be substituted for the internal detectors during operation in the External ALC mode.

The RF path includes separate levelers for the 2-8, 8-20, and 20-26 bands. During operation in the downconverter band (below 2 GHz), the 2-8 leveler adjusts the level of the RF input to the downconverter mixer. During operation in the 20-40 GHz band, levelers in the harmonic doubler circuit adjusts the output level.

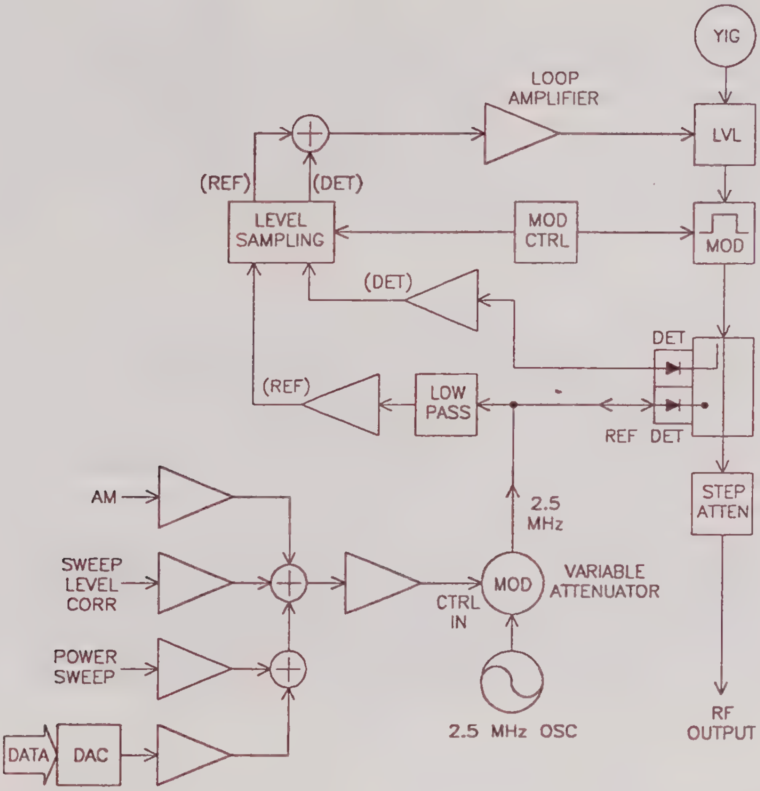

YIG
LOOP AMPLIFIER
LVL
(REF)
(DET)
LEVEL SAMPLING
MOD CTRL
MOD
(DET)
DET
(REF)
LOW PASS
REF
DET
STEP ATTEN
AM
2.5 MHz
SWEEP LEVEL CORR
MOD
VARIABLE ATTENUATOR
CTRL IN
POWER SWEEP
2.5 MHz OSC
RF OUTPUT
DATA
DAC

*Figure 3.6: Level control and AM*

## 3.6 AMPLITUDE MODULATION

Amplitude modulation is accomplished by adding a modulation input to the level control loop. The AM input is combined with the leveling reference generated by the CPU and DAC, in such a way that the amplitude of the modulating signal tracks any changes in level (this insures that AM depth remains constant for different levels). The level control circuit's output to the leveler is therefore modulated by the AM input waveform, and the instrument's RF output becomes amplitude modulated.

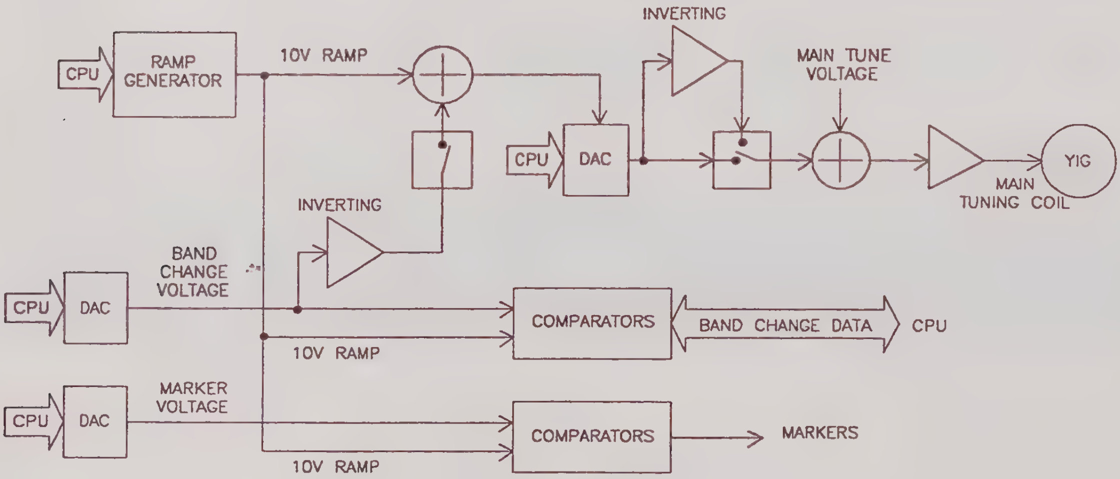
## 3.7 STEP/DWELL SWEEP

Because it is computer controlled, the synthesizer can easily be used as a sweeper. The user selects start and stop frequencies, and the instrument sweeps between those limits once or repetitively, by various increments, at various rates or in single steps. An analog output proportional to progress between sweep limits is available, with 0 volts at the start frequency and +10 volts at the stop frequency. A pen lift output signal is provided for controlling a recorder pen: the signal is low (a transistor to ground) during sweep and is high during sweep reset or when the sweep is in hold. A single sweep or a single step can be initiated by means of a trigger input as well as by pushbutton.

## 3.8 ANALOG FREQUENCY SWEEP

Analog sweep operation is driven by a 10V ramp generator. The CPU sets the speed of the ramp in order to control sweep time. The ramp output is applied to a multiplying digital-to-analog converter; the CPU programs the DAC with the multiplying factor, to adjust the ramp's amplitude (and therefore sweep width). The DAC ramp is summed with the main tuning output of the YIG driver circuit, and is applied to the main tuning coil of the YIG oscillator, in order to raise the output frequency from its starting value. An inverting amplifier can be switched into the path between the DAC and the main tuning coil, in order to reverse the sweep direction.

The CPU programs two other DACs, in order to generate band-change voltages and marker voltages. Comparators detect when one of these voltages is reached, and trigger the sweep circuits to initiate a band change or produce a marker output. In addition, the band-change voltage passes through an inverting amplifier and is summed with the 10V ramp at band changes, so that each band in the sweep begins with a zero-volts sweep input to the YIG driver circuit (this insures that the sweep band begins from the correct starting frequency).



CPU
RAMP GENERATOR
10V RAMP
INVERTING
MAIN TUNE VOLTAGE
CPU
DAC
YIG
MAIN TUNING COIL
INVERTING
BAND CHANGE VOLTAGE
CPU
DAC
COMPARATORS
BAND CHANGE DATA
CPU
10V RAMP
MARKER VOLTAGE
CPU
DAC
COMPARATORS
MARKERS
10V RAMP

*Figure 3.7: Analog frequency sweep*

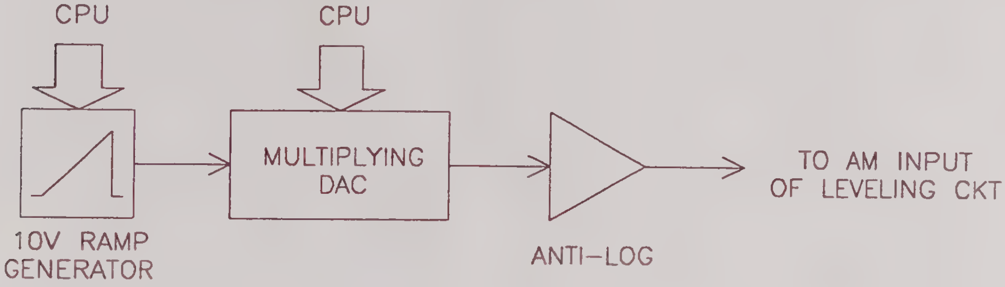

CPU
CPU
MULTIPLYING DAC
TO AM INPUT OF LEVELING CKT
10V RAMP GENERATOR
ANTI–LOG

*Figure 3.8: Analog power sweep*

## 3.9 ANALOG POWER SWEEP

The feature is implemented by applying a ramp to the AM input of the level control circuit. The CPU programs a 10V ramp generator, setting its speed in order to control sweep time. The ramp is applied to a multiplying digital-to-analog converter; the CPU programs the DAC's multiplier in order to control the amplitude of the ramp and therefore the sweep range. The DAC output passes through an anti-logarithmic amplifier (which corrects for the non-linearity of the compensation detector in the level control loop) and is applied to the AM input of the leveling circuit. The level control output, and therefore the RF output amplitude, tracks the ramp input.

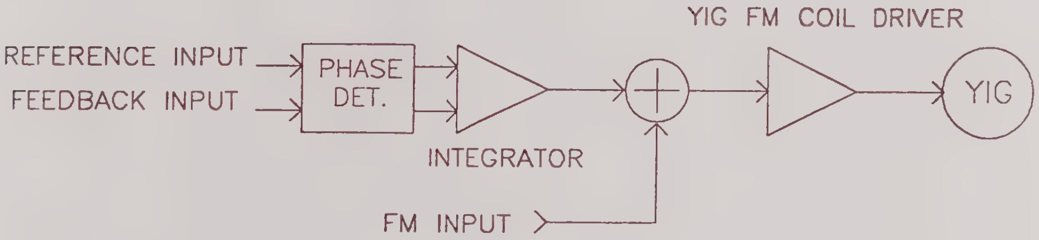

YIG FM COIL DRIVER
REFERENCE INPUT
FEEDBACK INPUT
PHASE DET.
INTEGRATOR
FM INPUT
YIG

*Figure 3.9: Frequency modulation*

## 3.10 FREQUENCY MODULATION

This feature is implemented by injecting a modulating signal into the output phase lock loop circuit. The modulation input is summed with the output of the loop's phase detector and integrator; the combined signal drives the FM (fine tuning) coil of the YIG oscillator. The RF output frequency tracks the variations in the input to the FM coil.

# 4 Calibration and Testing

The following procedures are included:

| **Calibration Procedures** | **Section** | **Performance Tests** | **Section** |
|---|---|---|---|
| Power Supply | 4.1 | Frequency Range, Resolution, and Accuracy | 4.17 |
| Phase Lock Loop, 100 MHz | 4.2 | Spurious Signals | 4.18 |
| Sampler Drivers, 100 MHz VCO | 4.3 | Single Sideband Phase Noise | 4.19 |
| YIG Driver Calibration | 4.4 | RF Output Power | 4.20 |
| Level Calibration | 4.5 | Pulse Modulation On/Off Ratio | 4.21 |
| Pulse Generator Calibration | 4.6 | Pulse Modulation Rise/Fall Time | 4.22 |
| AM Calibration | 4.7 | Pulse Modulation Overshoot and Settling Time | 4.23 |
| FM Calibration | 4.8 | Pulse Modulation Accuracy | 4.24 |
| Digital Ramp | 4.9 | Internal Pulse Generator | 4.25 |
| Spectral Purity | 4.10 | Amplitude Modulation | 4.26 |
| 10 MHz Time Base | 4.11 | Frequency Modulation | 4.27 |
| Analog Frequency Sweep | 4.12 | Internal Modulation Generator | 4.28 |
| Analog Power Sweep | 4.13 | *Test Data Sheet* | *p. 4-29* |
| Rear Panel | 4.14 | | |
| Front Panel | 4.15 | | |

REQUIRED WARM-UP TIME: 2 hours (72 hours for time base oscillator)

*RECOMMENDED EQUIPMENT:*

Frequency Standard, 10 MHz

Oscilloscope, Tektronix 2465 or equivalent

Microwave Frequency Counter, Systron Donner 6245B or equivalent

Power Meter/Sensor, Giga-tronics 8541 with 80303A Sensor or equivalent

Spectrum Analyzer, HP 8566B or equivalent

Scalar Analyzer, Giga-tronics 8003 or equivalent

Detector, Herotek Model # DZ262-44 or equivalent

Function (Audio) Generator, Wavetek 191 or equivalent

Measuring Receiver, HP 8902A or equivalent

Distortion Analyzer, HP 339A or equivalent

Signal Generator/LO Generator, Giga-tronics Microwave Synthesizer

Downconverter Mixer for 8902A

Universal Counter, Racal Dana 1994 or equivalent

Mixer IF Amplifier with Divide-by-40 output

## *CALIBRATION PROCEDURES*

### 4.1 POWER SUPPLY CALIBRATION

This procedure checks power supplies at test points on board A11. Voltages are also verified on the motherboard, A101.

1. On board A11, use a DVM and measure the following power supplies. Adjust the appropriate pot if required.
2. On A11 check TP2 for 8.0 V. Adjust the +8 pot.
3. On A11 check TP1 for 10.0 V. Adjust the +10 pot.
4. On A11 check TP3 for 35.0 V. Adjust the +35 pot.
5. On the A101 motherboard or at the test points on the A11 board, verify that the voltages in the following table are within ±0.3 V:

| SUPPLY | LOCATION | COLOR |
|---|---|---|
| +20 V | A11-85 | Brown |
| +8 V | A11-15 or TP2 | Red, Gray |
| +10 V | A11-19 or TP1 | Red, Black |
| +15 V (hot) | A11-95 | Blue, Black |
| +22 V | A101, MB | Orange |
| +15 V | A101, MB | Blue |
| -15 V | A101, MB | Violet |
| -5 V | A101, MB | Green |
| +5 V | A101, MB | Red, Green |

### 4.2 PHASE LOCK LOOP, 100 MHz

Ensure that the high stability timebase oscillator has warmed up for two hours. The warm-up time is not required if an external 10 MHz standard is used. Boards A14 and A201 are referenced in this procedure.

1. On A14, monitor TP1 on the scope. On board A201, adjust C23 to +3.0 V ±0.1 V.
2. On A14, the lock LED should be out indicating a locked condition. The front panel Lock LED should be on.
3. **OPTIONAL:** On A14, unplug J5. Then verify that the 'unlock' LED is on, and the front panel 'lock' LED is off. TP 1 should rail to approximately +14 V. Reconnect J5.
4. **OPTIONAL:** On A14, unplug J4. Then verify that the 'unlock' LED is on, and the front panel 'lock' LED is off. TP 1 should rail to approximately -3V. Reconnect J4.
5. At the rear panel, apply a 10 MHz external source to REF IN. Verify that the unit phase locks on the 10 MHz source. The 'lock' LED on the front panel is on. Disconnect the 10 MHz source.
6. At the rear panel, connect the BNC cable from 'REF OUT' to the scope. Verify that the unit's 10 MHz output is ≥2 Vpp into 50 Ω. Disconnect the BNC cable from the scope.
7. While BNC cable is still connected to 'REF OUT', connect the other end of this cable to the 'REF IN' connector on the rear panel. Verify that the unit unlocks. On A14 the 'unlock' LED is on. On the front panel the 'lock' LED is off. Disconnect the BNC cable.

## 4.3 SAMPLER DRIVERS, 100 MHz VCO (Optional)

1. This step is optional. Remove the Philips screws on the 100 MHz VCO panel cover. On A201, monitor the sampler driver signal at R45 with the scope. Peak the sampler driver by adjusting C32 for maximum peak to peak voltage. The scope should indicate a voltage of approximately 4 Vpp, or greater. Use C33 to peak the second driver (monitor the signal at R46). Replace cover and tighten screws.

## 4.4 YIG DRIVER CALIBRATION

This procedure adjusts the coarse and fine tuning of the YIG oscillators. There is one reference YIG (controlled by the Reference PLL) and up to three output YIGs (controlled by the Output PLL). This procedure calibrates both ends of each YIG band. Boards A16 and A19 are referenced in this procedure.

1. **REFERENCE YIG:** On A19, adjust the 'min' and 'max' pots for the Reference YIG, at the min and max frequencies shown in the table below. On A16, TP1, the test point voltage should be 0 V ±1 V.

| Output Frequency, GHz | Adjust Pot (A19 Board) | Reference YIG Frequency, GHz |
|---|---|---|
| 7.9 | R2 Max | 7.805 |
| 2.0 | R1 Min | 1.905 |

2. Since the R1 and R2 pots interact, repeat step 1 until the test point voltage reads 0 V ±1 V at both frequencies.
3. **OUTPUT YIG:** On A19, adjust the 'min' and 'max' pots for the Output YIGs, at the min and max frequencies shown in the table below. On A18, TP1, the test point voltage should be 0 V ±1V.

| Output Frequency, GHz | Adjust Pot (A19 Board) |
|---|---|
| 7.9 | R12 Max |
| 2.0 | R11 Min |
| 20.0 | R24 Max |
| 8.0 | R23 Min |
| 26.0 | R36 Max |
| 20.0 | R35 Min |

4. Since the 'min' and 'max' pots listed in the table interact, repeat step 4 for each band until the test point voltage reads 0 V ±1 V at the min and max frequencies for that band.
5. After all bands have been calibrated, use the front panel UP/DOWN buttons to step the output frequency of the instrument through its range in 100 MHz increments, and verify that all bands are correctly calibrated. Monitor the test points on A16 and A18 with a scope or DVM to insure that test point voltages remain at 0V ±1V throughout all ranges.

## 4.5 LEVEL CALIBRATION

This procedure ensures that the level specified by the front panel controls is the actual RF output level. The A10A1 PC board is referenced in this procedure. Some of the adjustments are located on the A10 board, and some are located on the A10A1 piggyback board, which is mounted on the A10 board.

1. Use a DVM to monitor TP3 on A10. The test point voltage should be 3.2 V ±0.01 V. If required, adjust pot R48.
2. Connect a power sensor to the front panel 'RF OUT' connector.
3. Set the instrument's output frequency to 2 GHz (or 1 GHz, if the instrument includes the downconverter range).
4. On A10, adjust the pots shown in the table below in order to measure accurate output levels (±0.03 dB) at 0 dBm, 10 dBm, and -9 dBm.

| OWER | FOR 2 GHz OUT | FOR 1 GHz OUT |
|---|---|---|
| 0 dBm | LIN >2, pot R4 | LIN <2, pot R3 |
| 10 dBm | GAIN >2, pot R29 | GAIN <2, pot R27 |
| -9 dBm | OFFSET >2, pot R30 | OFFSET <2, pot R28 |

## 4.6 PULSE GENERATOR CALIBRATION

1. Connect the instrument's 'SYNC OUT' to Input A of the Universal Counter. Connect the instrument's 'VIDEO OUT' to Input B of the counter.
2. Set the counter to Time Interval (TI) A-B, 50 Ω inputs (A and B), rising edge triggered, DC coupled, level 0.5 V.
3. Set the instrument to internal pulse modulation, rate 100 kHz, width 5 μs, delay 2 s.
4. Verify a 2 second delay ±10 ms on the frequency counter. If required, adjust C32 on A5-A1 to achieve this.

## 4.7 AM CALIBRATION

NOTE: Parts of the equipment setup can also be used in the FM calibration steps.

### 4.7.1 Equipment Setup

1. Connect an external function generator to 'AM IN' on the instrument's front panel with a BNC tee connector. Connect the oscilloscope Channel 1 input to the BNC tee. The scope should display a clean sine wave.
2. Connect the instrument's RF output to the RF input of a mixer (a 20 dB pad may be required at the mixer input). Connect the output of a signal generator (4.2 GHz, +10 dBm) to the LO input of the mixer.
3. Connect the IF output of the mixer to the 8902A measuring receiver, with filters set at 50 Hz and 15 kHz.
4. Select the AM mode with p-p divide by 2 on the 8902A receiver. Optional: Connect the receiver modulation output to channel 2 on the scope.

### 4.7.2 AM External Procedures

1. Select AM EXT at 50%.
2. Use the external generator to apply a 2 Vpp, 1 kHz sine wave to AM IN. Measure the sine wave on the scope to ensure accuracy.
3. Select 4 GHz and 0 dBm.
4. On A10, if required, adjust R5 for a 50% reading on the receiver.

### 4.7.3 AM Internal Procedures

1. Select AM INT SIN at 50% and at a 1 kHz rate.
2. On A6-A1, if required, adjust R4 for a reading of 50% ± 0.05%.
3. Select AM INT TRI. Verify that the receiver reads 50% ± 0.5%.
4. Select AM INT SQR at 50%.
5. On the receiver, turn off the 50 Hz and 15 kHz filters.
6. On A6-A1, if required, adjust R9 for a receiver reading of 50% ± 0.05%.

## 4.8 FM CALIBRATION

After the AM/FM generators are verified use these steps to calibrate the FM output.

### 4.8.1 Equipment Setup:

1. On the front panel, connect an external function generator with a BNC tee connector to FM IN. Connect a scope to the BNC tee at channel 1. Ensure that the scope displays a clean sine wave. A mixer with a divide by 40 output is required. Connect this mixer to RF OUT on the front panel.
2. Then connect the RF output of the LO signal generator to the mixer. The LO generator is set to 4.2 GHz at +5 dBm to provide an offset. Connect the divide by 40 output of the mixer to the 8902A measuring receiver.
3. The divide by 40 function produces readings that are 1/40th of the actual unit deviation. For example, the 25 kHz receiver reading in this procedure is a result of divide by 40.
4. On the 8902 receiver, the filters are set at 50 Hz and 15 kHz. Select the FM mode. Option: Connect Channel 2 on the scope to the modulation output on the receiver.

### 4.8.2 FM External Procedure

1. Select FM EXT at 1 MHz deviation.
2. Use the external generator to apply a 1 kHz sine wave at 2 Vpp to FM IN. Measure the sine wave on the scope to ensure accuracy.
3. Select the frequencies listed in the table in order and adjust the specified pot, if required for 25 ± 0.05 kHz.

| Frequency, GHz | A18 Pots | LO Freq, GHz |
|---|---|---|
| 4 | R33 | 4.2 |
| 1 | none | 1.2 |
| 12 | R34 | 12.2 |
| 22 | R35 | 22.2 |

### 4.8.3 FM Internal Procedure

1. Select 4 GHz. Then enter FM INT SIN with a 1 MHz deviation and at a 1 kHz rate. Set the LO generator for 4.2 GHz.
2. On A6-A1, if required, adjust R13 for a reading of 25 kHz ±0.05 kHz.
3. Select the triangle mode. Wait approximately 20 seconds for the signal to settle. Verify that the reading is 25 kHz ±0.05 kHz.
4. Select FM INT SQR at a rate of 8 kHz. On the receiver, enable the 20 kHz filter. On A6-A1, if required, adjust R18 for a receiver reading of 25 ± 0.05 kHz.

## 4.9 DIGITAL RAMP

1. The digital ramp controls the YIG output during sweep.
2. Select a FREQ STEP SWP of 2 GHz to 3 GHz with 100 ms dwell time. Monitor the frequency on a counter that is connected to RF out on the front panel.
3. Check for proper operation in single sweep mode. This should sweep once each time key is pressed. Press STOP/RESET and verify single steps when UP/DOWN keys are pressed.
4. Connect trigger signal to SWP TRIG IN. Set up unit for EXT SWEEP. The external signal source should have a negative transition, +5 V to GND.
5. Next, trigger unit and verify sweep. Press STOP/RESET to verify single step increments on each transition.
6. Select AUTO mode. On rear panel, monitor PEN LIFT OUT with a scope. Verify that signal is TTL low during sweep and TTL high during retrace end of sweep.
7. On rear panel, monitor LOCK/LVL OUT with scope. TTL should be high when unit is locked and leveled, TTL should be low when unit is unlocked or unleveled.
8. On front panel, attach a scope to RAMP OUT. When unit step sweeps any frequency range, verify a 0 to 10 V ramp with steps.

## 4.10 SPECTRAL PURITY

1. Select 2.0 GHz. Connect a spectrum analyzer to RF OUT on the front panel. On board A18, adjust balance pot R8 for minimum 1 MHz sidebands.

## 4.11 TIME BASE, 10 MHz

The following steps check and calibrate the 10 MHz reference time base. NOTE: This is only a setability test and not an accuracy test.

**CAUTION** - The unit must warm up for **72 HOURS** before the high stability oscillator can be checked and calibrated as required.

1. On the scope, connect the output from a frequency standard (10 MHz) to the external trigger (Channel 1) input. Adjust the scope to trigger on Channel 1.
2. On the rear panel of the unit, connect a cable to REF OUT. Connect the other end of this cable to the vertical input on the scope. Verify that the 10 MHz signal trace does not drift more than 100 ns in 1 second.
3. If adjustments are required, remove the top cover of the unit. The high stability oscillator is located next to the fan assembly. Remove the screw. Adjust the coarse and fine tune pots so that the signal trace is within the drift specifications.

## 4.12 ANALOG FREQUENCY SWEEP

The purpose of this test is to verify the accuracy of the sweep.

### 4.12.1 Sweep Test Setup:

1. On front panel, connect scope to RAMP OUT.

### 4.12.2 Analog Sweep Procedure:

1. Select ANALOG FREQ SWP from 2 GHz to 3 GHz. Select SWP TIME of 100 ms.
2. On the scope, verify 100 ms ± 2.5%, 10 V RAMP. The RAMP may exceed 10 V slightly.
3. If required, on A8 adjust R58 for 100 ms RAMP. Set start at 10 MHz, stop at 26.5 GHz. The stop value depends on the range of the unit.
4. On A8, connect scope to TP1. Set scope for 20 mV per division.
5. As shown on the following table, on A8, adjust pots as required to 0V ± 5 mV between bands. This adjustment is required for the dead time at the start of each band.

| Band, GHz | A9, Adjust Pots |
|---|---|
| 2-6 | R26 |
| 8-20 | R27 |
| 20-26 | R28 |

### 4.12.3 Filter Alignment Test

1. While in analog sweep mode, select 10 MHz to 26.5 GHz, 200 millisecond sweep time. Scope BLANK/MKR on rear panel. Trigger scope on each marker in the following table and adjust the corresponding pot on A19, if required. Trigger level is -2.5 V, so that filter pulse occurs immediately after marker pulse. **Note:** The +5 V filter pulses may override the markers. This makes the markers seem to disappear during adjustments.

| Marker Number | Frequency, GHz | A19 Adjustment |
|---|---|---|
| 1 | 3.2 | R50 |
| 2 | 5.2 | R49 |
| 3 | 12.7 | R47 |

### 4.12.4 Marker Alignment Test

1. Set up scope to observe marker and noise burst on Channels 1 and 2. Set analyzer to 0 frequency span. Trigger scope on Channel 1 at negative marker (-2.5V).
2. Apply 21.4 MHz output from back of analyzer to Channel 2 with 50 ohm on the scope. Set sweep to 100 ms. Trigger scope on Channel 1 at negative marker (-2.5V).
3. On unit, set SWEEP to 1 second.
4. If required, adjust the pots listed in the following table to align the IF burst with the blank marker pulse for a marker. For example, use Marker 1.

| Start, GHz | Stop, GHz | A19 Adjustment | Marker 1, GHz |
|---|---|---|---|
| 2 | 7.999 | R13 | 7.950 |
| 8 | 20.1 | R25 | 20.05 |
| 8 | 19.999 | R25 | 19.95 |
| 20 | 26.5 | R37 | 26.45 |

5. Set sweep to 10 ms. Set START to 2 GHz, STOP to 7.999 GHz. Set marker 1 to 5 GHz.
6. Set the spectrum analyzer center frequency to 5 GHz. If the filter pulses cause the marker to disappear, change center frequency to 4.9 GHz or lower.
7. On A8, adjust R39 (YIG LAG) to line up the 21.4 MHz IF burst with Marker 1 pulse.
8. If required, recheck filter pulses. Refer to Filter Alignment Test in this procedure.

### 4.12.5 Analog Flatness Setup - 2 to 20 GHz and 26.5 GHz

1. Set the scalar analyzer with 1 dB/div scale. Reference is 0 dBm. On unit set sweep time to 500 ms.
2. Select sweep from 2 GHz to 26.5 GHz. On scalar analyzer, set start and stop from 2 GHz to 26.5 GHz.
3. Make the following adjustments, if required, on A9: Adjust R27 and R29 for an RF OUT flatness of within ± 1 dB.

### 4.12.6 Analog Flatness Setup - 0.01 to 2 GHz (Downconverter)

1. On the unit, select START/STOP for 0.01 to 1.999 GHz. Sweep time is 500 ms. Select 0 dBm on scalar analyzer. Set start and stop to 10 MHz at 1.999 GHz.
2. Make the following adjustments, if required, on A9: Adjust R44, R43, R45, R51 for a flatness of within ± 1 dB.

## 4.13 ANALOG POWER SWEEP CALIBRATION

The purpose of this test is to verify the accuracy of analog power sweep.

### 4.13.1 Test Setup

1. On the scalar analyzer set start and stop to 2 GHz. Set scale to 5 dB per division.
2. Select CW mode at 2 GHz. Set START/STOP at -9.99 dBm (Start) and 10.00 dBm (Stop). Select SWEEP TIME of 500 ms.
3. Store this power sweep setup in memory 1.
4. On A9, if required, adjust the following pots:
   R12, Start Power
   R3, Stop Power
   R13, Linearity
5. Select Analog Power Sweep. Start at +10 dBm and Stop at -10 dBm. Store this setup in Memory 0.
6. Recall Memories 0 and 1. Repeat adjustments on A9 as required.

### 4.13.2 Power Stop Point Setup, +10 dBm

1. On the analyzer, set the scale for 1 dB. Set the reference level to +10 dB.
2. Select memory location 0. Then select memory location 1. Verify that power starts and stops at +10 dBm ±1 dB.

### 4.13.3 Power Stop Point Setup, -10 dBm

1. On the analyzer, set the scale for 1 dB. Set the reference level to -10 dB.
2. Select memory location 0. Then select memory location 1. Verify that power starts and stops at -10 dBm ±1 dB.

## 4.14 REAR PANEL

The purpose is to verify the accuracy of the rear panel outputs.

### 4.14.1 Test Setup

1. Select analog sweep. Select START and STOP frequencies of 2.0 GHz and 7.9 GHz.
2. Setup 8 MARKERS at 100 MHz separation. Select 2.1 to 2.8 GHz. Set sweep to 100 ms rate.
3. Verify 8 MARKERS that are approximately 150 ms wide.

### 4.14.2 BLANK/MKR Test

1. While 8 MARKERS are selected, verify BLANK/MKR (not) out voltages are as follows:
   0 V during sweep
   +5V during blanking and filter changes
   -5V during markers

### 4.14.3 NEG BLANK Test

1. Verify NEG BLANK out voltages are as follows:
   0 V during sweep
   -5 V during blanking and filter changes

### 4.14.4 Other BNC Connectors

1. Verify the .5V/GHz output is correct for analog freq sweeps.
2. Verify that the .5V/GHz output is 0V at 10 MHz. Also verify that 10 V at 20 GHz during sweep and in CW modes.
3. Select Analog Sweep in AUTO MODE. Ground STOP SWEEP I/O BNC and verify that sweep stops.

## 4.15 FRONT PANEL BNC TESTS

1. In analog sweep, verify a 0 to 10 V at RAMP BNC from FSTART to FSTOP.
2. Verify EXT SWP TRIG IN operates correctly. A +5V to 0V transition should start the sweep. Other transitions at this BNC, during this sweep, should *not* retrigger the sweep.

## PERFORMANCE TESTS

### 4.16 INTRODUCTION

The procedures listed in this section are used to verify the electrical performance of the Series 7200 using the specifications of Section 1. For many of these tests, an automated procedure exists which speeds up the taking of data. The program code for operating these tests is available on disk in MS-DOS format (contact your Giga-tronics sales representative).

### 4.16.1 Equipment Required

Each of the Performance Test Procedures in this section includes a list of recommended test equipment. In addition there is a consolidated list at the end of the section. Equipment required only for automated tests is noted. Equivalent test equipment may be substituted provided that the accuracies and specifications are sufficient.

### 4.16.2 Test Data Sheet

A Test Data Sheet is included to allow entering the various readings taken. The specification and tolerance range is listed to allow ease of verification. It is suggested that copies be made of the manual sheets. When automated tests are run, a printed data sheet is produced.

### 4.16.3 Calibration Cycle

Periodic performance verification is required to insure proper instrument performance. The instrument performance should be checked at least once each year.

### 4.16.4 Warm-up

Each of the procedures specifies a warm-up time which is required if the procedure is to be done individually. For a sequence of tests only one warm-up period is required. All test equipment must be warmed up according to its specifications.

## 4.17 FREQUENCY RANGE, RESOLUTION AND ACCURACY

### *SPECIFICATION*

| | |
|---|---|
| RANGE: | 2 to 20 GHz (optionally .01 to 26.5 GHz) |
| RESOLUTION: | 1 MHz (optionally 1 Hz) |
| ACCURACY: | same as time base accuracy |

### *DESCRIPTION*

The output of the UUT is connected to the input of a frequency counter. The internal time base of the counter is used as a reference for the UUT, to eliminate time base errors from the measurements. This procedure does not check for time base accuracy and therefore the UUT frequency display should agree with the counter, within each instrument's resolution.

Note that it is possible for Model 7200 to fail in way which, although the lock indicators show normal operation, will cause frequency errors. It is for this reason that a number of (specific) frequencies are tested. Test frequencies have been selected and are tested such that any defective circuits are more easily isolated.

### *EQUIPMENT REQUIRED*

Frequency counter
Coaxial cable
SMA to BNC adapter

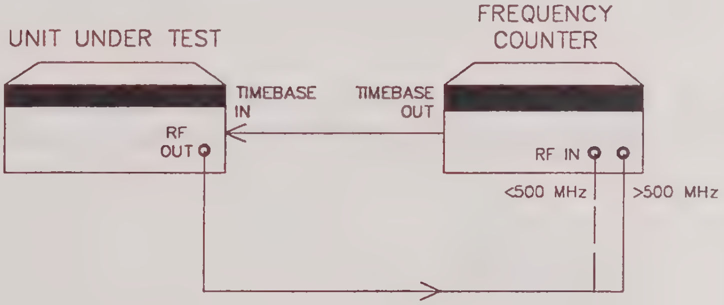


*Figure 4.1: Frequency range, resolution, & accuracy*

### *PROCEDURE*

1. Connect the equipment as shown in the figure. If the UUT includes the .01 to 2 GHz band, connect the UUT's RF Output to the 10 MHz-500 MHz counter input using the coaxial cable and the SMA to BNC adapter. If not, then connect the output to the 500 MHz-26.5 GHz input of the counter. Allow the equipment at least 30 minutes of warm-up. Since the UUT and the counter use the same time base, time base errors are eliminated. The UUT will automatically switch to the external reference when it is connected.
2. (Skip this step if the UUT does not include the .01 to 2 GHz band). Press **[SHIFT] [RESET]** on the UUT, then press **[1] [0] [MHz]**. Press **[LEVEL]** and enter [-] [1] [0] [dBm]. The counter should read 10 MHz ± 1 Hz ± the counter resolution.
3. If necessary, connect the UUT's RF out to the counter 500 MHz-26.5 GHz input. Press **[SHIFT] [RESET]** on the UUT, then press **[2] [0] [GHz]** (or **[2] [6]** [.] [5] **[GHz]** if the 20 to 26.5 GHz band is installed. The counter should read the entered frequency ± 1 Hz ± the counter resolution.
4. To check that the 'Divide-by-N' circuit is functioning properly, refer to the Test Data Sheet and program each of the listed frequencies into the UUT by entering (for example) [CW] [2] [0] [0] [1] [MHz]. For each listed frequency the counter should read the entered frequency ± 1 Hz ± the counter resolution. The frequencies listed are arranged in a binary

sequence since the 'Divide-by-N' circuit works in that manner. By setting the frequencies listed, each data bit supplied to the divider is individually tested.

5. If the UUT includes the 1 Hz Resolution option, perform this test. This test exercises the 1 Hz through 100 kHz digits in such a manner that any incorrect digital programming data being sent to the 1 Hz Resolution assembly will be detected. Improper operation of the 1 Hz assembly itself will likewise be indicated. Refer to the Test Data Sheet and program each of the listed frequencies into the UUT.

## 4.18 SPURIOUS SIGNALS TESTS

*SPECIFICATION*

| | |
|---|---|
| HARMONICS (up to 26.5 GHz): | <-55 dBc, 0.05 to 26.5 GHz;<br><25 dBc, 0.01 to 0.05 GHz |
| SUB-HARMONICS: | None |
| NON-HARMONICS: | <-55 dBc |

POWER LINE/FAN ROTATION RELATED (dBc, CW MODE):

| Frequency Range (GHz) | Offset from Carrier | | |
|---|---|---|---|
| | <300 Hz | 300 Hz to 1 kHz | >1 kHz |
| .01 to < 2 | -45 | -55 | -55 |
| 2 to < 8 | -50 | -60 | -65 |
| 8 to < 20 | -45 | -55 | -55 |
| 20 to 26.5 | -40 | -50 | -55 |

*DESCRIPTION*

The output of the UUT is connected to a spectrum analyzer. Various frequencies are selected and the analyzer tuned to determine the presence of either harmonically or non-harmonically spurious signals.

*EQUIPMENT REQUIRED*

Spectrum analyzer
Coaxial cable

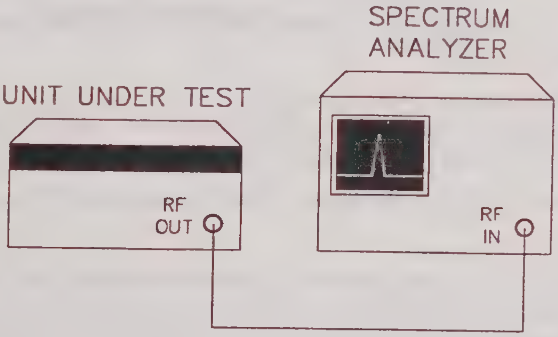


*Figure 4.2: Spurious signals test*

*PROCEDURE*

1. Connect the equipment as shown in the figure. Allow the equipment at least 30 minutes of warm-up time.
2. Press the **[SHIFT] [RESET]** on the UUT. Press the **[CW]** key and enter the first Test Data Sheet frequency which is within the range of the particular instrument. The RF amplitude should be at 0 dBm (the reset value). Press the **[RF ON/OFF]** button and turn on the RF output.
3. Set the spectrum analyzer to view the UUT output signal. Adjust the analyzer reference level such that the peak of the displayed signal is at the top graticule line.

# CAUTION

Many spectrum analyzers have a tuned preselector when the frequency is above about 2 GHz. This reduces the likelihood of analyzer-generated spurious signals, but does not eliminate the possibility. If in doubt, increase the *RF Attenuation* of the analyzer by 10 dB. The signal in question should be reduced by exactly 10 dB. If not, it is analyzer generated. It is also important, for frequencies below the range of the preselector, that sufficient analyzer RF Attenuation be used (typically 30 dB) to avoid the analyzer generating harmonics of the input signal. The above attenuator shift technique will also allow verifying harmonic levels.

If a spurious signal appears to be out of specification, first verify that the fundamental signal level is at 0 dBm. Next verify the analyzer accuracy by connecting a known amplitude signal (from the UUT, for example) at the spurious frequency.

Note that the digi-dial on the front panel of Model 7200 may generate some noise spikes when it is rotated. The acquisition of the various phase lock loops in the instrument can also cause transients (within the specified settling time). Both of these effects will disappear when a steady state condition has been reached.

Set the spectrum analyzer to a span of 50 Hz per division with the signal centered on the screen. Gradually increase the span to allow observing any spurious signals. Use appropriate resolution and video bandwidths to allow sufficient dynamic range.

# NOTE

It is important to identify the particular 'class' of spurious signal as the specifications may be different for each.

If the spurious is an exact multiple of the UUT RF output then the harmonic specification applies.

There are no subharmonics in Model 7200, as all frequencies are fundamentally generated (or mixed, if below 2 GHz).

If the spurious signal is a multiple of the power line mains frequency or the fan (the fan is a DC fan, the components it produces are typically below 1200 Hz and do not move if small changes are made in the RF frequency) then the Power Line/Fan Rotation specification applies.

Any other spurious signal must meet the non-harmonically related specification.

4. Repeat steps 2 and 3 for the other frequencies on the Test Data Sheet which are within the operating range of the instrument. For frequencies above the fundamental range of the spectrum analyzer, either a mixer supplied with the spectrum analyzer or an external mixer and local oscillator may be used to 'downconvert' the signal. Care must be taken to identify spurious signals which are inherently generated by the mixing process.

## 4.19 SINGLE SIDEBAND PHASE NOISE

*SPECIFICATION*

| Frequency Range (GHz) | Offset form Carrier | | | | |
|---|---|---|---|---|---|
| | 30 Hz | 100 Hz | 1 kHz | 10 kHz | 100 kHz |
| .01 to < 2 | -60 | -75 | -80 | -75 | -100 |
| 2 to < 8 | -65 | -75 | -80 | -80 | -105 |
| 8 to <20 | -60 | -65 | -75 | -75 | -100 |
| 20 to 26.5 | -55 | -65 | -70 | -70 | -95 |

*DESCRIPTION*

The test described here is limited by the measuring system and only verifies the majority of the phase noise specification. To completely test the phase noise specification requires a far more sophisticated measurement system. This test uses the spectrum analyzer to make all measurements from 100 Hz to 100 kHz offsets. The 100 Hz offsets are particularly susceptible to measurement system limitations.

*EQUIPMENT REQUIRED*

Spectrum analyzer
Coaxial cable

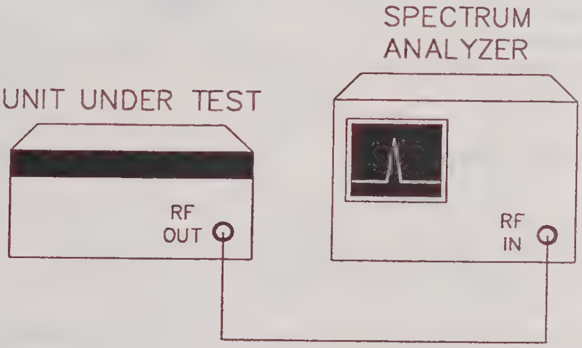


*Figure 4.3: Single sideband phase noise*

*PROCEDURE*

1. Connect the UUT's RF output to the spectrum analyzer input. Place the UUT on a foam pad to isolate it from any external mechanical vibrations which could affect the phase noise measurement.
2. Press [SHIFT] [RESET] on the UUT.
3. For the first frequency on the Test Data Sheet which is within the range of the instrument, press [CW] and enter the frequency. Tune the spectrum analyzer to the generator frequency and adjust the UUT's RF level to obtain a reference of 0 dBm on the analyzer. This allows direct measurement of the phase noise by the analyzer.
4. Set the analyzer span such that the desired offset is at ±2 divisions, select an appropriate bandwidth, activate the phase noise measurement and place the marker two divisions above the carrier. Read the phase noise in dBc/Hz. Repeat for all offsets.
5. Repeat 3 and 4 for the other Test Data Sheet frequencies which are within range of the UUT.

## 4.20 RF OUTPUT POWER TESTS

*SPECIFICATION*

| | |
|---|---|
| MAXIMUM LEVELED OUTPUT: | >+ 10 dBm |
| MINIMUM OUTPUT LEVEL: | -130 dBm (-110 dBm if range exceeds 20 GHz) |
| LEVEL ACCURACY: | ± 1 dB to 20 GHz;<br>± 2 dB to 26.5 GHz (± .1 dB/10dB) |
| LEVEL FLATNESS: | Included in accuracy |

*DESCRIPTION*

Although it is possible to make the following measurements manually, it is extremely tedious. It is strongly recommended that an automated system be set up to take and record the data. Suitable programs are available from Giga-tronics. Three tests are run. The first measures the maximum available output with the instrument leveling disabled. The second verifies the accuracy and flatness across the operating frequency range at a fixed output (0 dBm). The remaining test checks the step attenuator accuracy at a number of frequencies. The procedure outlines the general procedure followed by the automated system, a similar measurement could be done manually.

*EQUIPMENT REQUIRED*

Local Oscillator
Power meter and sensor
Measuring receiver
Downconverter
Plotter
Computer and programs

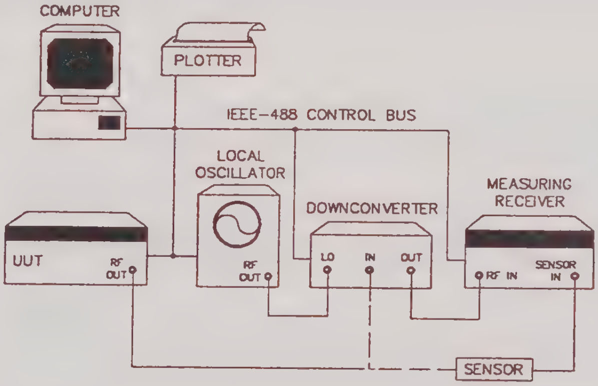


*Figure 4.4: RF output power tests*

PROCEDURE

1. Connect the power meter sensor to the UUT. Disable the leveling system of the UUT. Step the frequency across the particular instrument operating range in 50 MHz increments. At each point measure the power, apply the appropriate sensor correction factor, and plot the result.
2. Using the above setup, set the UUT to 0 dBm with the leveling enabled. Again step the frequency across the operating range, measure, correct and plot the power
3. Connect the UUT to the measuring receiver via the downconverter. With the UUT at 0 dBm and set to the first test frequency, establish a reference on the receiver. Reduce the UUT output in 10 dB steps, observing and recording the receiver reading. As needed, perform the recalibration requested by the receiver. Repeat for the remaining test frequencies.

## 4.21 PULSE MODULATION ON/OFF RATIO TEST

*SPECIFICATION*

| | |
|---|---|
| ON/OFF RATIO: | > 80 dB (CW mode, all frequencies) |

*DESCRIPTION*

The UUT is set to a CW frequency at a power level of 0 dBm. A spectrum analyzer is used to view the signal. The pulse modulation is then enabled and the resulting waveform is measured.

*EQUIPMENT REQUIRED*

Spectrum analyzer
Coaxial cable

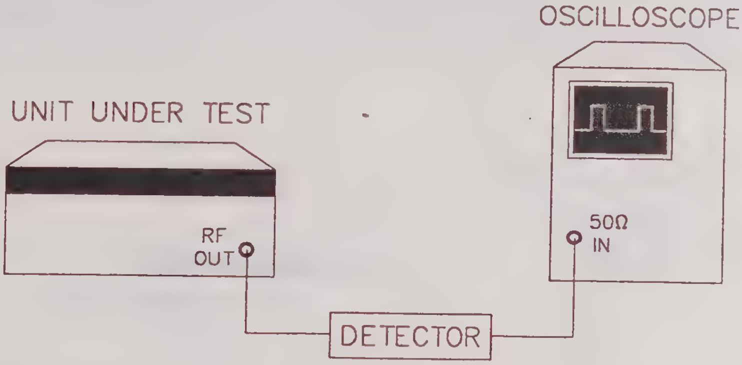


***Figure 4.5: Pulse modulation on/off ratio test***

*PROCEDURE*

1. Connect the equipment as shown in the figure. Allow 20 minutes warm-up time.
2. Press **[SHIFT] [RESET]** on the UUT and enter the first frequency on the test data sheet which is within the frequency range of the instrument. The RF power level should be at 0 dBm.
3. Tune the analyzer to the source frequency, select an analyzer span of 0 Hz, and fine tune the analyzer to place the line at the top of the screen graticule (adjust analyzer reference level as needed).
4. Set the pulse modulation on the UUT as follows: Press **[PM] [RATE] [100] [HZ] [WIDTH] [50] [MS]** to establish a 100 Hz squarewave.
5. Adjust the analyzer sweep time to display a few cycles of the waveform. Use internal triggering. Reduce resolution bandwidth and carefully retune the analyzer center frequency until the maximum resolution is achieved. Read and record the peak-to-peak value (use marker delta).
6. Repeat steps 3-5 for all other Test Data Sheet frequencies which are within the range of the instrument.

## 4.22 PULSE MODULATION RISE AND FALL TIME TEST

*SPECIFICATION*

| | |
|---|---|
| RISE/FALL TIME: | <10 nanoseconds (CW mode, any output frequency) |

*DESCRIPTION*

A crystal detector is connected to the UUT, terminated in 50 Ω, and monitored with an oscilloscope.

NOTE: It is very important to use either the specified detector or one with similar risetime characteristics. Even when terminated in 50 Ω with a short cable, the detector parameters can markedly influence the measurement.

*EQUIPMENT REQUIRED*

Oscilloscope
Crystal detector

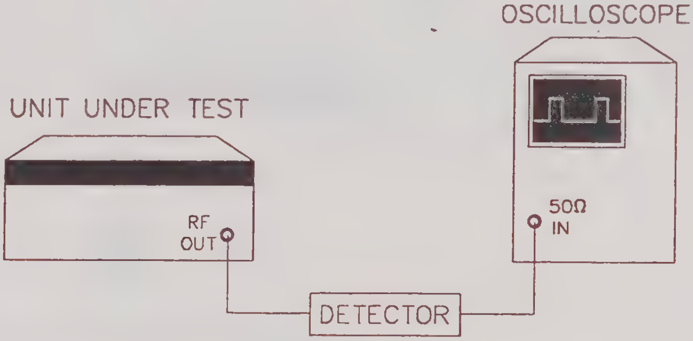


*Figure 4.6: Pulse modulation rise and fall time test*

*PROCEDURE*

1. Connect the equipment as shown in the figure. The cable from the detector to the oscilloscope should be kept as short as possible.
2. Press [SHIFT] [RESET] on the UUT and set the frequency to the first Test Data Sheet frequency which is within the operating range of the instrument.
3. Enable the pulse modulation of the UUT by pressing [PM] [MODE..(INT)] [SCROLL..(RATE)] [1] [MHZ] [SCROLL..(WIDTH)] [.5] [US] [ON].
4. Set the oscilloscope to 5 mv/div and using the RF Level control of the UUT, adjust the peak to peak oscilloscope display to fall on the dotted lines on the screen (100% and 0%). Adjust the oscilloscope sweep time to 5 ns/div. Measure and record the rise and fall times between the 10% and 90% points.
5. Repeat step #4 for each of the Test Data Sheet frequencies which is within the operating range of the instrument.

## 4.23 PULSE MODULATION OVERSHOOT AND SETTLING TIME

*SPECIFICATION*

| | |
|---|---|
| OVERSHOOT/UNDERSHOOT/RINGING: | ±2 dB maximum |
| SETTLING TIME: | < 100 ns to within 1 dB |

*DESCRIPTION*

A crystal detector is connected to the UUT, terminated in 50 Ω, and monitored with an oscilloscope.

NOTE: It is very important to use either the specified detector or one with similar risetime characteristics. Even when terminated in 50 Ω with a short cable, the detector parameters can markedly influence the measurement.

*EQUIPMENT REQUIRED*

Oscilloscope
Crystal detector

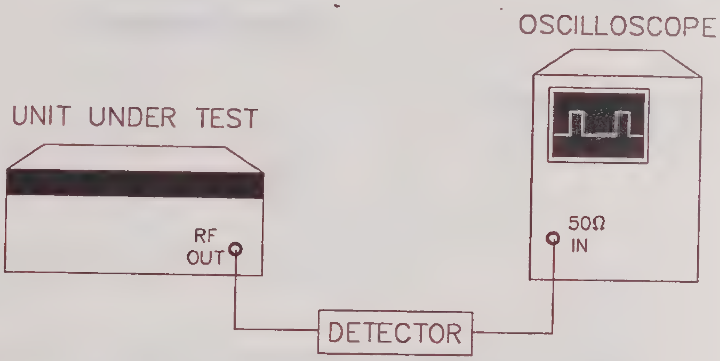


*Figure 4.7: PM overshoot and settling time*

*PROCEDURE*

1. Connect the equipment as shown in the figure. The cable from the detector to the oscilloscope should be kept as short as possible.
2. Press **[SHIFT] [RESET]** on the UUT and set the frequency to the first Test Data Sheet frequency which is within the operating range of the instrument.
3. Enable the pulse modulation of the UUT by pressing **[PM] [MODE..(INT)] [SCROLL..(RATE)] [1] [MHZ] [SCROLL..(WIDTH)] [.5] [US] [ON].**
4. Set the oscilloscope to 5 mv/div and using the RF Level control of the UUT and the vertical position of the oscilloscope, adjust the peak to peak oscilloscope display to be from the top of the screen (pulse off) to 2 divisions below the center line (pulse on). Adjust the oscilloscope sweep time to 50 ns/div. Change the level setting of the UUT by plus and minus 1 dB and note the graticule position of the pulse on level. Return to the original value. Measure and record the time for the pulse to be within 1 dB of its final value.
5. Change the level setting of the UUT by plus and minus 2 dB and note the graticule position of the pulse on level. Return to the original level. Measure and record any undershoot/overshoot of the signal.
6. Repeat steps 4-5 for each of the Test Data Sheet frequencies which is within the operating range of the instrument.

## 4.24 PULSE MODULATION ACCURACY TEST

*SPECIFICATION*

| | |
|---|---|
| ACCURACY, REFERENCED TO CW POWER LEVEL: | ± .5 dB (Typical) >100 ns PW |

*EQUIPMENT REQUIRED*

Oscilloscope
Crystal detector

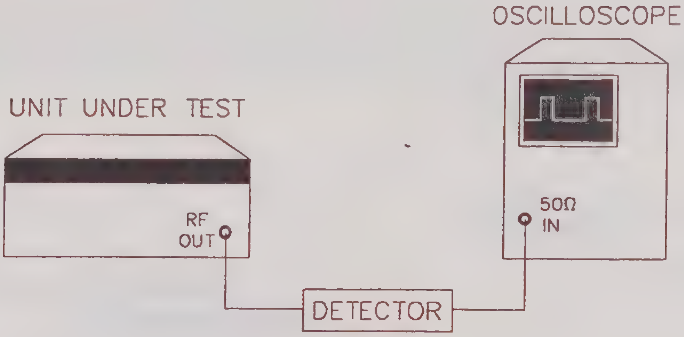


*Figure 4.8: Pulse modulation accuracy test*

*PROCEDURE*

1. Connect the equipment as shown in the figure. The oscilloscope input impedance should be 50 ohms. Allow 20 minutes warm-up.
2. Press **[SHIFT] [RESET]** on the UUT and set the frequency to the first Test Data Sheet frequency which is within the UUT's operating range.
3. Set the oscilloscope to 5 mv/div and using the vertical position of the oscilloscope, adjust the trace to the centerline of the screen. Change the level setting of the UUT by plus and minus 1 dB and note the trace position on the screen. Return to 0 dBm.
4. Enable the pulse modulation of the UUT by pressing **[PM] [MODE..(INT)] [SCROLL..(RATE)] [200] [kHz] [SCROLL..(WIDTH)] [1] [US] [ON]**.
5. Measure and record the difference between the CW reference level and the negative peak of the pulse, width >100 ns.
6. Change the pulse width to 50 ns and again measure and record the difference between the CW reference level and the negative peak of the pulse.
7. Repeat steps 4-6 for each Test Data Sheet frequency which is within the operating range of the UUT.

## 4.25 INTERNAL PULSE GENERATOR TESTS

*SPECIFICATIONS*

| | |
|---|---|
| REPETITION RATE ACCURACY: | ± .02% of range maximum value |
| DELAY ACCURACY: | The greater of ± 1% of setting or 20 ns |
| WIDTH ACCURACY: | The greater of ± 1% of setting or 20 ns |

*DESCRIPTION*

The time interval counter is used to measure each of the specified parameters at the rear panel PM Video output. The pulse delay measurements are referenced to the rear panel PM Sync output.

*EQUIPMENT REQUIRED*

Time interval counter

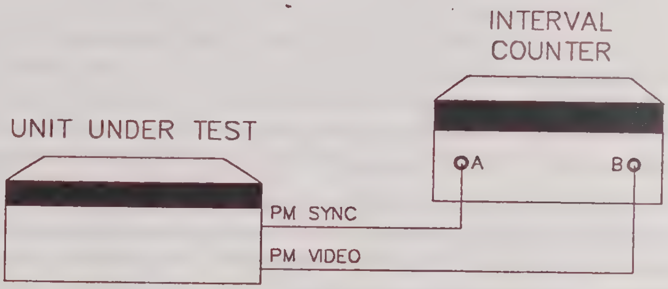


*Figure 4.9: Internal pulse generator tests*

*PROCEDURE*

1. Connect the PM sync to the counter A input and the PM Video to the B input.
2. Set the counter to measure 'Freq A'. For each Repetition Rate shown on the Test Data Sheet, measure and record the actual Pulse Repetition Frequency.
3. Set the counter to measure "TI A to B". For each Delay shown on the Test Data Sheet, measure and record the actual Pulse Delay.
4. Disconnect Sync from Channel A. Connect Video to Channel A. Set the counter to measure "Pulse width A". For each width shown on the Test Data Sheet, measure and record the actual Pulse Width.

## 4.26 AMPLITUDE MODULATION TESTS

### *SPECIFICATIONS*

| | |
|---|---|
| DEPTH: | At least 90% |
| ACCURACY: | ± 5% |
| BANDWIDTH: | DC to ≥ 50 kHz @ 3 dB point (measured at 30%) |
| FREQUENCY RESPONSE: | ± .2 dB from DC to 10 kHz, relative to 1 kHz (measured at 30%) |
| HARMONIC DISTORTION: | ≤ 2% @ 50% depth and ≤ 1 kHz rate<br>≤ 10% @ 50% depth and ≤ 50 kHz rate |
| EXTERNAL SENSITIVITY: | 0.1 volt peak/10% depth (within accuracy) |

### *DESCRIPTION*

The output from the UUT is mixed down to a VHF IF and then connected to a measuring receiver. For the modulation depth and accuracy tests, the modulation receiver makes a direct measurement. Modulation bandwidth and frequency response is measured in the relative mode, referenced to 1 kHz. The internal measurement capability of the measuring receiver is used to measure distortion at 1 kHz. For distortion measurements at higher modulating frequencies, an external distortion analyzer is used. Sensitivity is measured using an external source and RMS voltmeter.

NOTES: All of the tests may be run using the internal modulation source, however if the Harmonic Distortion specification is not met the test should be repeated with a known low distortion external modulation source. The internal generator is typically better than the specification but the specification is referenced to an external source.

Since the measuring receiver is not capable of measurements below 20 Hz, it is not possible to use it to verify performance at DC. The design of the Model 7200 modulator system is such that meeting the flatness specification at 20 Hz virtually guarantees conformance at DC. DC tests may be made with a power meter if desired.

### *EQUIPMENT REQUIRED*

Local Oscillator
Mixer/IF amplifier
Modulation Analyzer
Function Generator
Digital Voltmeter
Distortion Analyzer

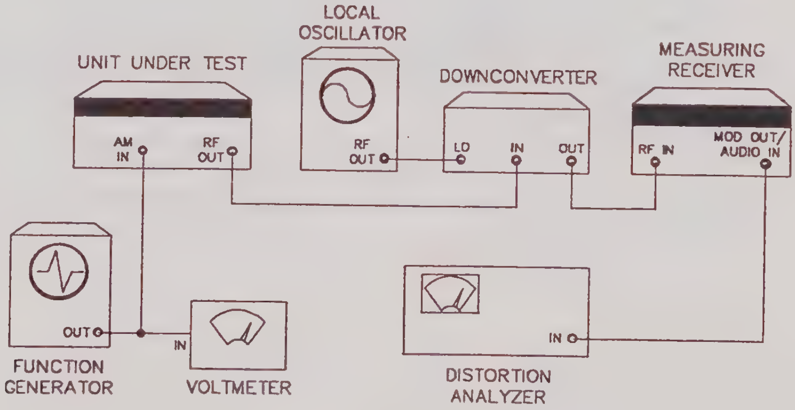


*Figure 4.10: Amplitude modulation tests*

NOTE: The mixer/IF amplifier specified may be constructed from readily available off-the-shelf components. The mixer must have an RF and LO frequency range at least as great as the generator under test. The mixer IF should be at least 300 MHz. To prevent overload of the mixer, a 10 dB pad is used on the RF port and the LO port operated at a level of +7 to +10 dBm. The IF amplifier should have about 15 to 20 dB of gain at 130 MHz and a bandwidth not exceeding 300 MHz.

*PROCEDURE*

1. Connect the equipment as shown in the figure. Allow about 20 minutes warm-up time. Press [SHIFT] [RESET] on the UUT. The following steps are to be performed at each frequency on the Test Data Sheet. In each case, set the local oscillator 130 MHz below the test frequency.
2. Set the function generator to a frequency of 1 kHz and (measured with the digital voltmeter in AC mode) an amplitude of 1 volt peak (.707 volts rms). Press **[AM] [MODE..ext] [SCROLL..%] [99] [%] [ON]** on the UUT. Set the measuring receiver to AM mode with the 20 kHz high pass filter on. Verify that the modulation depth is at least 90%.
3. Press **[AM] [70] [%]** on the UUT. Read and record the depth on the measuring receiver. Press **[AM] [50] [%]** on the UUT and record the depth. Press **[AM] [30] [%]** on the UUT and record the depth.
4. Press **[AM] [MODE..sin]** and record the depth of the internal generator.
5. Vary the function generator over the range of 100 Hz to 10 kHz observing the digital voltmeter. Note any points whose amplitude varies more than .007 volts rms (this is about .08 dB). This calibration is necessary to be able to validate the ± .2 dB flatness specification. Reset the generator to 1 kHz.
6. Press **[AM] [MODE..ext]** on the UUT and verify that it is set for 30% AM. Put the measuring receiver in ratio mode, logarithmic. Slowly tune the function generator from 100 Hz to 10 kHz and observe the measuring receiver display. Record the maximum error in dB.
7. Turn off all the filters on the measuring receiver and deactivate the ratio mode. Reset the function generator to 1 kHz. Enable the measuring receiver ratio mode. Slowly vary the function generator upward from 10 kHz and note the frequency of the -3 dB point.
8. Set the low pass filter to 300 Hz and the high pass filter to 200 kHz. Set the function generator to 1 kHz. Press **[AM] [SCROLL] [50] [%]** on the UUT. Set the measuring receiver to measure distortion and record the reading.
9. Set the function generator to 10 kHz. Using the distortion analyzer, measure the harmonic distortion and record.

## 4.27 FREQUENCY MODULATION TESTS

*SPECIFICATIONS*

| | |
|---|---|
| DEVIATION: | 10 MHz peak |
| ACCURACY: | ±5% |
| BANDWIDTH: | 10 Hz to 5 MHz |
| EXTERNAL SENSITIVITY: | 2 Vpp for maximum deviation |

*DESCRIPTION*

The output from the UUT is connected to a discriminator. The discriminator output is modulated on an oscilloscope to determine deviation and bandwidth.

*EQUIPMENT REQUIRED*

Function Generator
Oscilloscope
Digital Voltmeter
FM Test Fixture

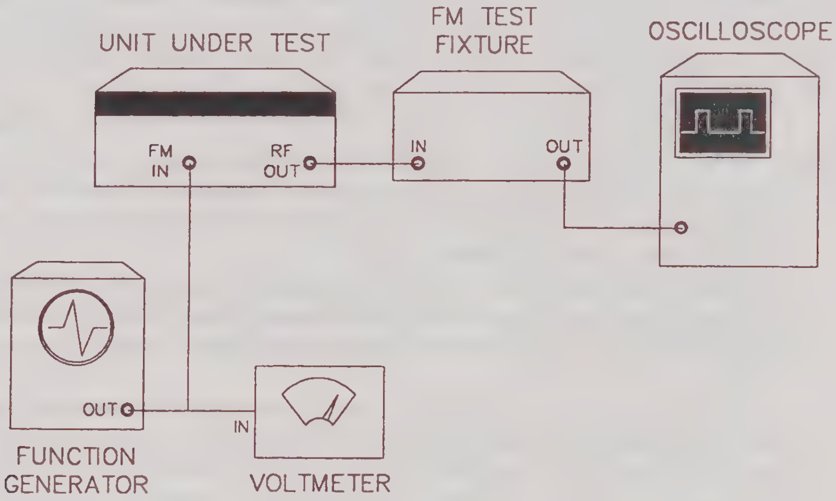


*Figure 4.11: Frequency modulation tests*

*PROCEDURE*

1. In order to calibrate and test the frequency modulation circuits, a special test fixture must be assembled. The recommended FM test fixture includes an RF splitter, two lines of equal length, and an RF mixer. The RF output of the UTT is divided by the splitter into two signals, unequally delayed. The required differential delay can be obtained by using two coaxial cables of, for example, 5 and 10 inches in length. The outputs of these delay lines are furnished to the two inputs of the RF mixer. For certain frequencies which may be identified by experiment, the mixer will produce a DC voltage near zero. The number of "null" frequencies can be increased by making the delay lines longer in absolute terms or by increasing the ratio between their lengths. If the output becomes frequency modulated, the mixer output voltage will change, and the voltage variation will be proportional to FM deviation. The polarity of the voltage change may be either directly or inversely related to the direction of frequency deviation. When voltage levels have been established for different frequencies, the mixer output can be monitored on an oscilloscope to provide a continuous display of FM deviation.

2. Connect the FM test fixture to the RF OUT connector of the UUT. Monitor the mixer output with the oscilloscope (5 mV/div). For each test data sheet frequency, set the UUT to the closest null frequency (that is, at a frequency where the mixer output voltage is zero); +5 dBm out, no modulation.
3. Establish the voltage at 3 MHz above and 3 MHz below the null frequency. Allow the oscilloscope gain and the UUT output power level (near +5 dBm) to place the null point at the center of the screen and the 3 MHz deviation points at 3 divisions above and 3 divisions below the null point.
4. Set the UUT to the FM internal 100 kHz SINE mode. Set the FM deviation to 3 MHz. Verify that the waveform is six divisions peak to peak +.3 divisions.
5. Set the UUT to EXT FM. Connect the function generator, set to a 100 kHz rate SINE wave, 2 Vpp. Verify that the waveform is 6 divisions peak to peak (±.3).
6. Adjust the UUT FM deviation for exactly a six division peak to peak display. Vary the function generator from 10 Hz to 1 MHz and verify that`the display remains between five and seven divisions peak to peak. Vary the function generator from 1 to 5 MHz and verify that the display remains between four and eight divisions peak to peak.

## 4.28 INTERNAL MODULATION GENERATOR TESTS

*SPECIFICATION*

| | |
|---|---|
| RANGE: | 1 Hz to 100 kHz (AM); 10 Hz to 1 MHz (FM) |
| ACCURACY: | ± .001 Hz |
| RESOLUTION: | 1 Hz |
| WAVEFORMS: | Sine, square, triangle |

*DESCRIPTION*

The output of each of the internal modulation generators (AM and FM) is connected to the frequency counter where the frequency range, resolution and accuracy is tested. The three waveforms are observed on an oscilloscope.

*EQUIPMENT REQUIRED*

Frequency counter
Oscilloscope

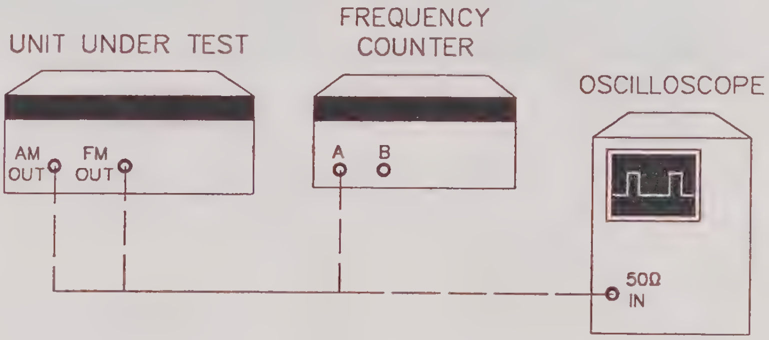


*Figure 4.12: Internal modulation generator tests*

*PROCEDURE*

1. Connect the equipment as shown in the figure. Allow about 20 minutes warm-up time. The AM and FM generator outputs are on the rear panel of the UUT.
2. Set the UUT to AM INT SQR and connect the AM out to the counter. Set the AM RATE to 1 Hz and using the period mode of the counter, determine the accuracy of the output.
3. Select each of the frequencies shown on the Test Data Sheet to verify proper resolution and range of the output. The counter should be in frequency measurement mode for these tests.
4. Disconnect the modulation generator output from the counter and connect it to the oscilloscope. Select SQR, SIN, and TRI waveforms and verify a proper waveform.
5. Set the UUT to FM INT SQR and connect the FM out to the counter. Set the FM RATE to 10 Hz and using the period mode of the counter, determine the accuracy of the output.
6. Select each of the frequencies shown on the Test Data Sheet to verify proper resolution and range of the output. The counter should be in frequency measurement mode for these tests.
7. Disconnect the modulation generator output from the counter and connect it to the oscilloscope. Select SQR, SIN and TRI waveforms and verify a proper waveform.

## Model 7200 Test Data Sheet, p. 1 of 4

| | | |
|---|---|---|
| Serial Number: | | TEST RESULTS: Record the measured value, if any. In the case of a function check or range check, write 'OK' to indicate that the unit under test meets specifications. |
| Date: | | |
| Tested By: | | |
| Quality Assurance: | | |

| **Frequency Range, Resolution, Accuracy** | | **[✓]** |
|---|---|---|
| .01-2 GHz Band Accuracy (if installed) | | |
| Accuracy at the UUT maximum frequency | | |
| Divide-by-N test frequencies | 2.111 GHz | |
| | 2.222 GHz | |
| | 2.444 GHz | |
| | 2.888 GHz | |
| | 2.123 GHz | |
| | 2.987 GHz | |
| 1 Hz Resolution test frequencies (Note: use any frequency for the >100 kHz digits.) | XXXX.000000 MHz | |
| | XXXX.111111 MHz | |
| | XXXX.222222 MHz | |
| | XXXX.444444 MHz | |
| | XXXX.888888 MHz | |
| | XXXX.123456 MHz | |
| | XXXX.987654 MHz | |

### Spurious Signals Tests

Note: Ignore frequency digits which exceed the resolution of the instrument.

| **Frequency (MHz)** | **Harmonics** | **Non-Harmonics** | **Line/Fan Related** |
|---|---|---|---|
| 770.550 | | | |
| 1513.425 | | | |
| 3536.171 | | | |
| 9182.433 | | | |
| 17361.522 | | | |
| 23541.349 | | | |

## Model 7200 Test Data Sheet, p. 2 of 4

| | | | |
|---|---|---|---|
| Serial Number: | | Tested by: | |
| Date: | | Quality Assurance: | |

### Single Sideband Phase Noise

| Frequency (MHz) | Phase Noise (dBc/Hz) | | | |
|---|---|---|---|---|
| | 100 Hz | 1 kHz | 10 kHz | 100 kHz |
| 1513.425 | (-75) | (-80) | (-75) | (-100) |
| 3536.171 | (-75) | (-80) | (-80) | (-105) |
| 9182.433 | (-65) | (-75) | (-75) | (-100) |
| 17361.522 | (-65) | (-75) | (-75) | (-100) |
| 23541.349 | (-65) | (-70) | (-70) | (-95) |

| RF Output Power | | [✓] |
|---|---|---|
| Power Level > +10 dBm over entire operating range | | |
| Power Level ± 1 dB <20 GHz; ± 2 dB ≥ 20 GHz | | |
| Step Attenuator test frequencies | 1.0 GHz | |
| | 4.0 GHz | |
| | 12.0 GHz | |
| | 17.0 GHz | |

### Pulse Modulation Tests

| Frequency (GHz) | On/Off (>80 dB) | Rise/Fall (<10 ns) | Overshoot (≤2 dB) | Settling (<100 ns) | Accuracy (± .5 dB) |
|---|---|---|---|---|---|
| 1.0 | | | | | |
| 4.0 | | | | | |
| 12.0 | | | | | |
| 22.0 | | | | | |

## Model 7200 Test Data Sheet, p. 3 of 4

| | | | |
|---|---|---|---|
| Serial Number: | | Tested by: | |
| Date: | | Quality Assurance: | |

### Pulse Generator Tests -- Rate

| Rate Set | Tolerance | Measured |
|---|---|---|
| 50 Hz | 49.98 - 50.2 | |
| 500 Hz | 499.8 - 500.2 | |
| 5 kHz | 4.998 - 5.002 | |
| 50 kHz | 49.98 - 50.02 | |
| 500 kHz | 499.8 - 500.2 | |

### Pulse Generator Tests -- Delay

| Delay Set | Tolerance | Measured |
|---|---|---|
| .5 sec | .495 - .505 | |
| 50 ms | 49.5 - 50.5 | |
| 5 ms | 4.95 - 5.05 | |
| .5 ms | .495 - .505 | |
| 50 µs | 49.5 - 50.5 | |
| 5 µs | 4.95 - 5.05 | |
| .5 µs | .480 - .520 | |
| 50 ns | 30 - 70 | |

### Pulse Generator Tests -- Width

| Width Set | Tolerance | Measured |
|---|---|---|
| .5 sec | .495 - .505 | |
| 50 ms | 49.5 - 50.5 | |
| 5 ms | 4.95 - 5.05 | |
| .5 ms | .495 - .505 | |
| 50 µs | 49.5 - 50.5 | |
| 5 µs | 4.95 - 5.05 | |
| .5 µs | .480 - .520 | |
| 100 ns | 80 - 120 | |

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| | | | |
|---|---|---|---|
| Serial Number: | | Tested by: | |
| Date: | | Quality Assurance: | |

### Amplitude Modulation Tests

| Parameter | @ 1 GHz | @ 4 GHz | @ 12 GHz | @ 22 GHz |
|---|---|---|---|---|
| Depth (≥90%) | | | | |
| Ext. % AM (65-75%) | | | | |
| Ext. % AM (45-55%) | | | | |
| Ext. % AM (25-35%) | | | | |
| Int. % AM (45-55%) | | | | |
| Bandwidth (>50 kHz) | | | | |
| Distortion (<2%) | | | | |
| Distortion (<10%) | | | | |

### Frequency Modulation Tests

| Parameter | @ 1 GHz | @ 4 GHz | @ 12 GHz | @ 22 GHz |
|---|---|---|---|---|
| Deviation (5.7-6.3 div) | | | | |
| Bandwidth (5-7 div) | | | | |
| Bandwidth (4-8 div) | | | | |

| Internal Modulation Generator Tests | | [✓] |
|---|---|---|
| AM Accuracy test<br>(±.001 Hz) | 1 Hz | |
| | 100 Hz | |
| | 1 kHz | |
| | 10 kHz | |
| | 100 kHz | |
| AM Mode Waveforms: Square, Sine, Triangle | | |
| FM Accuracy test<br>(±.001 Hz) | 1 Hz | |
| | 100 Hz | |
| | 1 kHz | |
| | 10 kHz | |
| | 100 kHz | |
| FM Mode Waveforms: Square, Sine, Triangle | | |

# 5 Maintenance

## 5.1 GENERAL MAINTENANCE

Under normal operation, this instrument requires little regular maintenance. It is recommended that the calibration procedure (as described in Section 4 of this manual) be performed at nine-month intervals to insure operational accuracy. The air inlet screen should be cleaned whenever a significant amount of dirt has accumulated.

During the warranty period of the instrument, it is recommended that no user initiated service work be performed without first communicating with the factory (or our authorized representative). Often the problem can be readily isolated to a particular plug-in module, for which a replacement can be sent.

## 5.2 TROUBLESHOOTING PROCEDURE

### 5.2.1 Introduction

Before any other analysis is attempted, three potential problem areas must be eliminated. First, be sure that all front panel controls are properly set. An apparent malfunction may be the result of an operator error, such as selecting external modulation without furnishing the needed modulation input. Press **[SHIFT] [RESET]** before proceeding, to clear any erroneous settings. Second, establish whether the problem exists only under remote control; if so, the cause could be a malfunctioning controller, an improper bus address, or an erroneous remote control command. Third, clean the plated edges of the plug-in circuit boards with a rubber eraser and alcohol, using a static-safe work area (malfunctions can be caused by an accumulation of dirt on these edges).

### 5.2.2 Defining the Area of Malfunction

It is important to establish under what circumstances a malfunction does (and does not) occur. Failure may occur in only a portion of the instrument's frequency range or level range, or only in a particular operating mode. Explore different settings and modes in order to find the limits of the malfunction. It may be found that a malfunction occurs only during remote control operation (see 5.3.10 below).

## 5.3 MALFUNCTIONS

Ten major areas of potential failure are addressed in this procedure. Each problem area is analyzed with a reference to the troubleshooting notes included in section 5.4 (e.g., "see 5.4.1").

### 5.3.1 General Failure

The instrument does not respond appropriately to commands given via the front panel controls or IEEE-488 interface; the readouts are blank, erratic, or fixed in one state.

*RECOMMENDATIONS:*

Check the power supplies (see 5.4.1).

Check the computer (see 5.4.2).

### 5.3.2 Loss of RF Output

No measurable power is present at the output connector, regardless of the RF level setting. The front panel 'LEVEL' indicator may or may not be lit.

*RECOMMENDATIONS:*

Check the power supplies (see 5.4.1).

Check the 10 dB step attenuator (see 5.4.3).

Check the YIG oscillator (see 5.4.5).

### 5.3.3 Incorrect Output Level

Output power is at a level other than that selected by the RF level setting. The front panel 'LEVEL' indicator may or may not be lit.

*RECOMMENDATIONS:*

Before proceeding, be sure that the selected RF level is within the capability of the instrument. Although the instrument must meet a maximum power specification, the actual maximum will be somewhat in excess of this, and will vary for different frequencies. When exceeding the normal power range, the 'LEVEL' indicator may go out and the instrument's RF output may fall below the level requested.

Check the power supplies (see 5.4.1).

If the level error is a 10 dB multiple (e.g., -20 dBm instead of +10 dBm), check the 10 dB step attenuator (see 5.4.3).

Check the leveler (see 5.4.6).

Check the detector (see 5.4.7).

Check the level control circuit (see 5.4.8).

### 5.3.4 Output Frequency Unlocked

The 'LOCK' indicator on the front panel is dark whenever any phase lock loop circuit in the instrument is unlocked. The output frequency will drift; the degree of frequency error depends on where the fault is.

*RECOMMENDATIONS:*

Check the power supplies (see 5.4.1).

Determine which loop is unlocked (see 5.4.9). If more than one is unlocked, work backwards from the output PLL as described below.

Check the output PLL (see 5.4.10).

Where the fault is isoltated to the output PLL's variable input, check the divide-by-N circuit (see 5.4.11).

Check the YIG driver (see 5.4.12).

Check the 100 MHz reference oscillator (see 5.4.13).

Check the 100 MHz PLL (see 5.4.14).

Check the 10 MHz master reference (see 5.4.15).

Where the fault is isolated to the output PLL's reference input:

Check the YIG driver (see 5.4.12).

Check the reference PLL (5.4.16).

Check the 1 Hz PLL (see 5.4.17).

Check the 100 MHz reference oscillator (see 5.4.13).

Check the 100 MHz PLL (see 5.4.14).

Check the 10 MHz master reference (see 5.4.15).

If the fault occurs in the range below 2 GHz, check the downconverter PLL (see 5.4.18)

### *5.3.5* Output Locked, but Frequency Incorrect

The 'LOCK' indicator is illuminated; the output frequency is stable, but incorrect.

*RECOMMENDATIONS:*

The troubleshooting procedure is the same as for the unlocked condition described in section 5.3.4 above. The same circuits are likely to be at fault, even if there is no indication of unlock; the problem may be caused by improper control or reference inputs rather than by complete circuit failure.

### *5.3.6* FM Malfunction

The instrument does not frequency modulate its RF output in accordance with the operator's commands.

*RECOMMENDATIONS:*

Check the power supplies (see 5.4.1).

Check the output PLL (see 5.4.19).

Check the AM/FM driver circuit (see 5.4.20).

### *5.3.7* AM Malfunction

The instrument does not amplitude modulate its RF output in accordance with the operator's commands.

*RECOMMENDATIONS:*

Check the power supplies (see 5.4.1).

Check the leveler (see 5.4.21).

Check the level control circuit (see 5.4.22).

Check the AM/FM Driver circuit (see 5.4.23).

### *5.3.8* Pulse Modulation Malfunction

The instrument does not pulse modulate its RF output in accordance with the operator's commands.

*RECOMMENDATIONS:*

Check the power supplies (see 5.4.1).

Check the modulator (see 5.4.24).

Check the pulse generator circuit (see 5.4.25).

### *5.3.9* Frequency Sweep Malfunction

The instrument does not sweep through the selected frequency range in accordance with the operator's commands, or does not generate the auxiliary sweep output signals.

*RECOMMENDATIONS:*

Check the power supplies (see 5.4.1).

Check the YIG driver board (5.4.26).

Check the analog sweep boards (see 5.4.27).

Check the digital ramp board (see 5.4.28).

### 5.3.10 Power Sweep Malfunction

The instrument does not sweep through the selected power range in accordance with the operator's commands, or does not generate the auxiliary sweep output signals.

*RECOMMENDATIONS:*

Check the power supplies (see 5.4.1).

Check the analog sweep #1 board (see 5.4.29).

Check the digital ramp board (see 5.4.30).

Check the level control board (see 5.4.31).

### 5.3.11 IEEE-488 Interface Malfunction

The instrument does not respond appropriately to commands sent via the interface, or exhibits a particular malfunction (see 5.3.1 through 5.3.10 above) only while under remote control.

*RECOMMENDATIONS:*

Check the power supplies (see 5.4.1).

Verify that all commands used are appropriate to this instrument (see section 2 of the manual for a complete listing of valid remote commands).

Check the IEEE-488/Timer circuit (see 5.4.32).

## 5.4 TROUBLESHOOTING NOTES

### 5.4.1 Power Supply

This is the common denominator among malfunctions of all types. Because the instrument has many regulated supplies, and they are not all used by all circuits, it is possible for the failure of a single supply to disable only a part of the system. For this reason power supply voltages should be checked whenever there is an instrument malfunction, even though the malfunction may seem limited or localized.

The power supply circuit board (A11) is located at the rear of the instrument; filter capacitors C1 through C5 are located along the center left side of the instrument beside the power transformer. The voltage regulators for the power supplies are located in the heatsink assembly, which is attached to the cooling fan. The individual supplies are:

- +5A. This +5 volt supply is used by the computer and other TTL-type circuits. Test point: Computer Bus (A100), +5V. Wire color: red.
- +5B. This +5 volt supply is used by RF circuits (such as phase lock loops). Test point: I/O Bus (A101), +5V. Wire color: red/green.
- -5. This -5 volt supply is used by ECL-type high speed logic circuits (such as frequency dividers). Test point: A100/A101, -5V. Wire color: green.
- Unregulated +9. This supply drives the alphanumeric displays of the data entry menu. The '9' is only an approximation of the actual voltage. Test point: A20, P2 pin 4 or 5. Wire color: white/red/red.
- +15A. This +15 volt supply is used by analog circuits (such as amplifiers and oscillators). Test point: A100/A101, +15V. Wire color: blue.

  The '+15A' supply can be subdivided into multiple switched supplies, at 15 volts or re-regulated down to lower voltages, depending on the requirements of the individual instrument. Instruments to 40 GHz require two +12V supplies to drive the frequency doublers; other instruments may require +8V and +10V supplies to drive particular amplifiers. These supplies are switched off when not needed.

- +15B. This +15 volt supply is independent of the power switch (it is on whenever AC power is applied to the instrument), and is used by the high stability timebase and the 'STANDBY' indicator on the front panel. Test point: High Stability Oscillator (A21). Wire color: blue/black.
- -15. This -15 volt supply is used by analog circuits. Test point: A101, -15V. Wire color: violet.
- +22. This +22 volt supply is used by YIG oscillators and by some analog circuits. Test point: A101, +22V. Wire color: orange.
- +24. This +24 volt supply is used by the cooling fan. Test point: positive terminal of electrolytic capacitor mounted on the side of the fan. Wire color: yellow.
- Unregulated +24. This supply (which is unrelated to the regulated +24 volt supply described above) is used to drive the relays of the step attenuator. The '24' is only an approximation of the actual voltage. Test point: power supply capacitor C4, positive terminal. Wire color: yellow.
- +35. This +35 volt supply is used by the fluorescent display drivers. Test point: A11, TP3. Wire color: gray.
- 8 VAC. This 8 volt AC supply (which is also tied to the '+5A' DC supply) is used by the fluorescent display heaters. Test point: A20 P2 pins 2 & 3 (AC must be measured across the terminals, not to ground). Wire color: violet.

*CORRECTIVE ACTION*

Check the line fuse; replace it if it is open. If the new fuse opens, check the power supply primary and secondary circuits.

If any supply output is at an incorrect voltage, remove all plug-in circuit boards. If the overload ceases, replace the boards one at a time to isolate the fault. If the overload persists, open the supply regulator output and verify regulator input and output voltages.

### 5.4.2 The Computer

All instrument functions are controlled by the computer, and a general computer failure will lead to a general system failure. The computer is based on the Motorola 68000 microprocessor. It uses a bus architecture which corresponds on a one-to-one basis with the signals from and to the 68000 chip itself.

*CORRECTIVE ACTION*

Five circuit boards house the computer:

- A1 -- This is the Front Panel Interface board, which acts as an interface between the microprocessor and the front panel.
- A2 -- This is the IEEE-488/Timer board. It includes the interface between the CPU and the remote control bus, as well as the timer circuit for the CPU and driver circuits for the step attenuator.
- A3 -- This is the Memory board, which holds the ROM devices in which the instrument's operating software is stored, as well as the RAM chips used by the computer for temporary data storage.
- A4 -- This is the CPU board, which houses the microprocessor and the address decoding logic through which it runs the instrument.

When a computer failure is suspected, the best way to troubleshoot the system is to isolate the problem to board level by substituting spare PC boards. If the problem persists with four spares, the problem may be on the computer bus board (the motherboard) into which the computer boards are plugged. Computer problems can be caused by dirt on the connections between these boards.

If the computer seems to have become "lost", it can be reset either by pressing the reset button on the CPU board (A4) or by turning the power switch off and on.

### 5.4.3 10 dB Step Attenuator

The programmable attenuator is capable of attenuating the RF output by as much as 90 dB or 110 dB, depending on the frequency range of the instrument; if the output is not at the desired power level, the cause may be that the attenuator is improperly set. Note that the attenuator is outside of the leveling loop, and therefore the leveling system cannot detect, or compensate for, attenuator errors.

*CORRECTIVE ACTION*

The programmable attenuator's internal structure includes a series of relays which add or remove lossy elements in binary multiples of 10 dB (10 dB, 20 dB, 40 dB, etc.) to achieve the desired total attenuation. The relay drivers which select these increments are located on the IEEE/Timer circuit board (A2). Verify that the attenuator is receiving the appropriate drive signals; if not, investigate the drivers on the IEEE/Timer board and the computer logic lines which control them.

### 5.4.4 RF Path

The RF path through the instrument contains switching circuits which are used for pulse modulation and for selection of filter lines. If the filter select/modulator control line for the active path is held at the "off" logic level, the RF signal will be shut down.

*CORRECTIVE ACTION*

The filter select/modulator control lines applied to the RF modules have positive voltages for "off" and negative voltages for "on" (levels are on the order of ±5 V). The signals originate on the YIG Driver board (A19). If inappropriate signals are received, investigate the driver circuits on that board and the computer logic lines which control them.

### 5.4.5 YIG Oscillator

All YIG oscillators require +15V and +22V supplies, and some also require a -5V supply. In addition to the power supply requirements, the YIG oscillator must have current supplied to its tuning coil within an appropriate range in order to generate an RF output of any kind. If tuning coil current is excessive or insufficient, there will be no output signal.

*CORRECTIVE ACTION*

The easiest way to measure coil current is to read the voltage drop across the sense resistor. This is a large, high-wattage, metal-encased resistor (usually 5 or 7 ohms, depending on the oscillator used) mounted near the YIG. One end is grounded, and the other is connected (through an NPN transistor controlled by the YIG driver board, A19) to the negative end of the YIG oscillator tuning coil. The voltage across the sense resistor, divided by its resistance, equals the coil current. The tuning sensitivity of most YIG oscillators is roughly 20 MHz/mA (or 30 MHz/mA, for the YIG in the 20-26 GHz range). The current (in Amps) for a given frequency may be found by dividing the frequency (in GHz) by 20 (or by 30, in the 20-26 GHz range). Current values corresponding to frequencies outside the range of the oscillator will shut the oscillator down.

If the coil current seems to be well out of range, investigate the NPN transistor (A107) and the YIG oscillator circuit (A19) which drives its base.

### 5.4.6 Leveler

The level control system adjusts the RF level by means of PIN-diode voltage-controlled attenuator circuits ('levelers') in the RF modules for each frequency band. The Level Driver circuit (A10A1) has outputs which drive the leveler pins on the outsides of the RF modules. The voltage input goes positive to increase attenuation, negative to reduce attenuation. The normal input range is 0 to +1 volt, but at minimum attenuation the input may swing to the negative rail of the amplifier which drives it.

*CORRECTIVE ACTION*

When the output level is incorrect, the leveler input voltage may be clearly inappropriate in a way which indicates the cause of the problem.

If output power is too low, and the leveler input is at the positive rail (maximum attenuation), the level control circuit is reducing the output power by sending a bad control signal; if output power is too low and the leveler at the negative rail (minimum attenuation), the level control circuit is trying unsuccessfully to compensate for power loss occurring somewhere in the RF path (the loss could be in the RF module itself).

If power is too high, and the leveler is at the positive rail (maximum attenuation), the leveler circuit within the module is faulty; if power is too high and the leveler at the negative rail (minimum attenuation), the level control circuit is increasing the output power by sending a bad control signal.

If the level control voltage is between the extremes of its range, but the output level is still incorrect, the fault is probably in the level control circuit (A10).

A failure of the leveler or other circuits within an RF module is unlikely, but can be caused by excessive reverse power applied to the front panel 'RF OUT' connnector.

### 5.4.7 Detector

The instrument's leveling system requires feedback from the RF path in order to control output power. This is provided by a negative-output diode detector, driven by a signal coupled from the RF output. There are two separate detectors for the ranges above and below 2 GHz, and also a reference detector which is used to cancel out the effect of detector non-linearity and temperature-related variations. A signal from a remote detector can also be substituted for the internal detectors (in the External ALC mode).

*CORRECTIVE ACTION*

A failure of the internal detectors themselves is unlikely, but it is important to verify continuity of detector signals between the detectors, the Detector Buffer board (A200), and the Level Control board (A10). When there is an apparent failure of the leveling system, disconnecting the relevant detector cable and observing the resulting changes is often a revealing experiment.

Be sure that the correct leveling mode is activated (external ALC should not be enabled unless an external detector is actually being used).

### 5.4.8 Level Control Circuit

The level control circuit board (A10) is basically a loop amplifier which must balance a variable input (feedback from the level detector) against a reference signal. The detector can be either the appropriate internal detector (<2 GHz or >2 GHz), or a remote detector (in the external ALC mode).

The reference signal is derived from a combination of inputs: the leveling reference programmed by the computer, the power sweep input (if any), the AM modulating signal (if any), the sweep level correction input (if any), and the output of a 'reference' detector which serves to cancel the effect of undesirable detector characteristics.

The level control circuit, using its output to drive the appropriate leveler in the RF path, adjusts output power in whichever direction will equalize the reference and variable inputs to the loop amplifier. So long as the output is between the extremes of its control range, the output is considered to be "leveled" and the indicator on the front panel will remain lit.

*CORRECTIVE ACTION*

If the 'LEVEL' indicator on the front panel is dark, the leveler output should be at one extreme or the other of its control range, and comparing the control signal with the result will indicate the nature of the problem (see 5.4.6 above). If the indicator is lit, the control signal should be within its control range, and if the output power is nevertheless incorrect, it is likely that the level control circuit is receiving a bad input, is defective, or has been incorrectly calibrated.

If possible, replace the level control circuit with a spare. Make sure that the potentiometers on the board have not been improperly adjusted (see the calibration procedure in Section 4). Check all inputs and control signals to the board. Be sure that the instrument has not been set to the wrong leveling mode (if an external detector is not being used, external ALC should be off).

An excellent way to investigate a problem in the leveling system is to break the loop, by disconnecting the detector or the leveler control line, and observe the resulting changes.

### *5.4.9* Individual PLL Lock Indicators

Each of the four phase lock loop circuit boards has an 'unlock' indicator, in the form of an LED which is dark only when the loop is locked.

*CORRECTIVE ACTION*

Determine which PLL or PLLs are unlocked. The relevant boards are:

- A14 (100 MHz PLL)
- A15 (1 Hz PLL)
- A16 (REF/DC PLL -- the reference and downconverter loops have separate indicators; the reference indicator is the one closer to the back of the instrument.)
- A18 (OUTPUT PLL)

### *5.4.10* Output Phase Lock Loop

This circuit is located on the A18 PC board.

*CORRECTIVE ACTION*

Verify that the 1 MHz input is being received from the divide-by-N circuit (A17).

Verify that the 10 MHz input is being received from the 100 MHz PLL circuit (A14).

The PLL's output goes more negative to increase the YIG output frequency, more positive to decrease frequency (be sure that the PLL output is not driving the YIG oscillator in the wrong direction).

Verify that the output signal is reaching the YIG oscillator FM coil.

If possible, replace the circuit with a spare.

### *5.4.11* Divide-By-N

This circuit is located on the A17 PC board.

*CORRECTIVE ACTION*

Verify that the 95 to 395 MHz IF is being received from the 100 MHz Assy (A201).

Verify that the circuit is being programmed with the correct divisor.

Verify that the IF is being correctly divided and that the output signal is reaching the output PLL (A18).

If possible, replace the circuit with a spare.

### *5.4.12* YIG Driver

This circuit is located on the A19 PC board.

*CORRECTIVE ACTION*

If this circuit is tuning the YIG oscillator to the wrong frequency, the error may be too large for the PLL to correct. The problem sometimes occurs after improper calibration of the YIG driver, in which case the output loop may be able to lock at some frequencies but not others. If the instrument develops phase lock problems after calibration of the YIG driver, try repeating the adjustment. Be sure to follow the correct calibration procedure, as outlined in Section 4 of the manual.

If the driver calibration is not to blame for the unlocked condition, attempts to adjust it may only aggravate the problem. Therefore, it is a good idea to determine first whether the driver output is approximately correct for the requested output frequency.

As described in 5.4.5 above, the oscillator tuning coil has a sensitivity of roughly 20 MHz/mA (30 MHz/mA for the 18-26 YIG). The NPN transistor (on A107) which controls the coil current is driven at its base by a control voltage from the YIG driver.

Because of large variations in coil impedence it is not possible to specify a "correct" voltage. However, it should be a positive voltage increasing with frequency at a rate of roughly 650 mV/GHz. A more exact idea of the coil current can be obtained from the voltage drop accross the sense resistor (see 5.4.5).

If the driver output seems substantially wrong, the cause could be bad control data to the digital/analog converter as well as bad calibration.

If possible, replace the circuit with a spare.

### *5.4.13* 100 MHz Reference Oscillator

This circuit board (A201) is encased in an aluminum housing mounted on the underside of the microwave chassis.

*CORRECTIVE ACTION*

This circuit is mounted in an inaccessible location; the most that can normally be done to investigate it in the field is to verify that its inputs are correct.

### *5.4.14* 100 MHz PLL

This circuit is located on the A14 PC board.

*CORRECTIVE ACTION*

Verify that the 10 MHz master reference input is being received.

Verify that the 100 MHz input is being received.

If possible, replace the circuit with a spare.

### *5.4.15* 10 MHz Master Reference

The internal timebase is located in the rear left of the unit; the 10 MHz input/output circuit is located on the 100 MHz PLL circuit board (A14).

*CORRECTIVE ACTION*

Verify that the signals from the internal timebase, and from the external timebase (if any), are being received by the 10 MHz input/output circuit.

Verify that the 10 MHz signal from the input/output circuit is reaching the various PLL circuits which require it.

### *5.4.16* Reference PLL

The reference PLL circuit is located on the Ref/DC PLL circuit board (A16).

*CORRECTIVE ACTION*

Verify that the reference sampler input is being received from the 100 MHz reference oscillator (A201).

Verify that the 10-12 MHz input is being received from the 1 Hz PLL circuit (A15), or that an external 5-6 MHz input is being received from the rear panel BNC.

If possible, replace the circuit with a spare.

### 5.4.17 1 Hz PLL

This circuit is located on the A15 PC board.

*CORRECTIVE ACTION*

Verify that the 10 MHz input is being received from the master reference.

Verify that the 10-12 MHz output is reaching the Ref/DC PLL (A16).

If possible, replace the circuit with a spare.

### 5.4.18 Downconverter PLL

This circuit is located on the Ref/DC PLL circuit board (A16).

*CORRECTIVE ACTION*

Verify that the downconverter sampler IF is being received from the 100 MHz reference oscillator (A201).

Verify that the 10 MHz timebase input is being received from the 100 MHz PLL (A14).

Verify that the tuning output of the circuit is reaching the fine tuning coil of the 2-8 YIG.

If possible, replace the circuit with a spare.

### 5.4.19 Output Phase Lock Loop (FM)

This circuit is located on the A18 PC board.

*CORRECTIVE ACTION*

Verify that the FM input signal is being received from the AM/FM Driver board (A6).

Verify that the FM control line line is activating the FM mode.

If possible, replace the circuit with a spare.

### 5.4.20 AM/FM Driver (FM)

This circuit is located on the A6 PC board.

*CORRECTIVE ACTION*

Verify that all control inputs are appropriate to the FM mode selected (e.g., remote or local control, internal or external FM, etc.), and that an external modulation input (if applicable) is being received.

Verify that the FM output signal is reaching the output PLL (A18).

### 5.4.21 Leveler (AM)

The variable attenuators in the RF modules, described in 5.4.6 above, are used for amplitude modulation as well as for RF leveling.

*CORRECTIVE ACTION*

Verify that the control signal is being received from the level control circuit (A10). The control pin should go more positive to increase attenuation, more negative to reduce attenuation.

### 5.4.22 Level Control Circuit (AM)

This circuit is located on the A10 PC board.

*CORRECTIVE ACTION*

Verify that the AM input signal is being received from the AM/FM Driver board (A6) and that the AM mode is being selected by the control input.

Verify that the AM signal is present on the output to the leveler.

If possible, replace the circuit with a spare.

### 5.4.23 AM/FM Driver (AM)

This circuit is located on the A6 PC board.

*CORRECTIVE ACTION*

Verify that all control inputs are appropriate to the AM mode selected (e.g., remote or local control, internal or external AM, etc.), and that an external modulation input (if applicable) is being received.

Verify that the AM output signal is reaching the level control board (A10).

### 5.4.24 Modulator

Path-switching circuits in the RF modules are also used for pulse modulation.

*CORRECTIVE ACTION*

Verify that the filter select/modulation control pin which is active for the requested output frequency has positive pulses corresponding with the "off" periods of the instrument's RF output; these should be received from the Pulse Driver board (A5).

### 5.4.25 Pulse Generator (PM)

This circuit is located on the A5A1 PC board.

*CORRECTIVE ACTION*

Verify that all control inputs are appropriate to the pulse mode selected (e.g., remote or local control, internal or external trigger, etc.), and that an external modulation input (if applicable) is being received.

Verify that the modulation output is reaching the appropriate pulse modulator pin on the appropriate RF module.

### 5.4.26 YIG Driver Board

This circuit is located on the A19 PC board.

*CORRECTIVE ACTION*

The sweep process is implemented through modification of the YIG driver's output control signal. A fault in this circuit may cause the instrument to sweep at the wrong rate, over the wrong range, or not at all. In the analog sweep mode, verify the required voltage ramp from the analog sweep boards (A8/A8A1). In the digital sweep mode, the YIG Ramp should not be active (the sweep steps are implemented through programming of the primary DAC). Verify that the DACs are receiving appropriate command signals from the computer. Be sure that the sweep potentiometer is not out of calibration. If possible, replace the circuit with a spare.

### 5.4.27 Analog Sweep Boards (Frequency Sweep)

These circuits, located on the A8 and A8A1 PC boards, may be considered functionally as a single circuit which produces sweep ramps, markers, and other signals necessary to analog frequency sweep operation.

*CORRECTIVE ACTION*

The analog sweep circuit requires control signals from the computer. Verify that the circuit is receiving the required signals, and is furnishing the necessary outputs to the YIG driver circuit (A19) and to the front and rear panels. If possible, replace with spares.

### 5.4.28 Digital Ramp Board (Frequency Sweep)

This circuit is located on the A9 PC board, and generates the 10V sweep ramp output in analog and digital frequency sweep operation.

*CORRECTIVE ACTION*

In the case of analog sweep, the 10V ramp is received from the Analog Sweep #1 PC board (A8); in the case of digital sweep, the 10V ramp is generated by means of a DAC on the digital ramp board itself. Verify that the ramp is being received, or generated (as appropriate) and is reaching the front panel sweep output connector.

If possible, replace the circuit with a spare.

### 5.4.29 Analog Sweep #1 Board (Power Sweep)

This circuit is located on the A8 PC board.

*CORRECTIVE ACTION*

Verify that the 10V ramp is being generated by this board, and is reaching the digital ramp board (A9).

If possible, replace the circuit with a spare.

### 5.4.30 Digital Ramp Board (Power Sweep)

This circuit is located on the A9 PC board.

*CORRECTIVE ACTION*

Verify that the 10V ramp is being received from the Analog Sweep #1 board, that this circuit is properly calibrated, and that the power sweep output of this circuit is reaching the level board (A10).

If possible, replace the circuit with a spare.

### 5.4.31 Level Control Board

This circuit is located on the A10 PC board.

*CORRECTIVE ACTION*

Verify that the power sweep input is being received from the digital ramp board, and is being summed with the other level control inputs.

If possible, replace the circuit with a spare.

### 5.4.32 IEEE-488 Interface/Timer Circuit

This circuit is found on the A2 PC board.

*CORRECTIVE ACTION*

Verify that this circuit's data and control lines have continuity to the rear panel connector and to the CPU. If possible, replace the circuit with a spare.

# 6 Parts Lists

**Parts List for 120DA00801 MODEL 7XXX BASIC UNIT Rev E**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120AAB0133 | 1 | 58900 | 120AAB0133 | MEMORY SET B133 |
| 2 | 120DA00700 | 1 | 58900 | 120DA00700 | STANDARD PCB ASY |
| 3 | 120DA00902 | 1 | 58900 | 120DA00902 | CHASSIS ASSY |
| 4 | 420DA46500 | 1 | 58900 | 420DA46500 | 7000 CHASSIS HARNESS |

**Parts List for 120DA00700 STANDARD PCB ASY Rev H**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| A 1 | 120BA01300 | 1 | 58900 | 120BA01300 | FRONT PANEL I/F PCA |
| A 2 | 120BA05300 | 1 | 58900 | 120BA05300 | IEEE / TIMER PCA |
| A 3 | 120BA01200 | 1 | 58900 | 120BA01200 | MEMORY PCA |
| A 4 | 120BA01100 | 1 | 58900 | 120BA01100 | CPU PCA |
| A 5 | 120BA09302 | 1 | 58900 | 120BA09302 | PULSE DRIVER PCA |
| A 9 | 120BA09100 | 1 | 58900 | 120BA09100 | DIGITAL RAMP PCA |
| A 10 | 120BA06510 | 1 | 58900 | 120BA06510 | LEVEL PCA |
| A 14 | 120BA06900 | 1 | 58900 | 120BA06900 | 100MHz REF PLL PCA |
| A 16 | 120BA07000 | 1 | 58900 | 120BA07000 | REF/DC PLL PCA |
| A 17 | 120BA07100 | 1 | 58900 | 120BA07100 | DIVIDE BY N PCA |
| A 18 | 120BA07210 | 1 | 58900 | 120BA07210 | OUTPUT PLL PCA |
| A 19 | 120BA08300 | 1 | 58900 | 120BA08300 | YIG DRIVER PCA |
| A 21 | 101BA39101 | 1 | 58900 | 101BA39101 | HI STAB OSC PCA |
| A10A1 | 120BA15520 | 1 | 58900 | 120BA15520 | LEVEL DRIVER PCA |

**Parts List for 120DA00302 SERIES 7200 Rev B**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120DA06610 | 1 | 58900 | 120DA06610 | FRONT PANEL M7200 ASY |
| 2 | 120BA14000 | 1 | 58900 | 120BA14000 | 8 CONN MTG PLATE ASY |
| 3 | 120DF06300 | 1 | 58900 | 120DF06300 | DEC PANEL M7200 |
| 4 | 003CA01603 | 1 | 58900 | 003CA01603 | OPT 16 1 HZ RESOLUTION |
| A 6 | 120BA09401 | 1 | 58900 | 120BA09401 | AM/FM DRIVER PCA |
| A 8 | 120BA09211 | 1 | 58900 | 120BA09211 | ANALOG SWEEP 1 PCA |

### Parts List for 120DA06610 FRONT PANEL M7200 ASY Rev A

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120DF04300 | 1 | 58900 | 120DF04300 | FRONT SUB-PANEL |
| 7 | HSDH-40504 | 1 | 55566 | 4531-440-SS-0 | 4-40 X 5/16 M/F SPACER |
| 8 | HSDH-40604 | 2 | 55566 | 4532-440-SS-0 | 4-40 X 3/8 M/F SPACER |
| 10 | KBR0-12525 | 1 | 32997 | KN-1251B-1/4 | ROUND KNOB W/O INDICATOR |
| 11 | 120BA09600 | 2 | 58900 | 120BA09600 | 11 DIG DISP RBN CBL ASY |
| 12 | 120BA09700 | 1 | 58900 | 120BA09700 | 5 DIG DISP RBN CABLE ASY |
| 13 | 120BA09800 | 1 | 58900 | 120BA09800 | 9 DIG DISP RBN CABLE ASY |
| 15 | 120BA10000 | 1 | 58900 | 120BA10000 | DATA ENTRY RBN CABLE ASY |
| 16 | 120BA10100 | 1 | 58900 | 120BA10100 | DISP DRIVER RBN CBL ASY |
| 17 | 120BA10201 | 1 | 58900 | 120BA10201 | OPT ENCODER HARNESS ASSY |
| 18 | JRDF-00001 | 5 | 02660 | 31-221 | BNC F PANEL MOUNT |
| 19 | HLLT-K1114 | 5 | 79963 | 814 | 3/8' (BNC) SOLDER LUG |
| 20 | JRAB-00200 | 1 | 93459 | 9934-3 | SMA F BULK MT CONN |
| 21 | 107BF01700 | 1 | 58900 | 107BF01700 | SMA CONNECTOR MOUNT FLAN |
| 22 | 107BF01701 | 1 | 58900 | 107BF01701 | SMA CONNECTOR MOUNT SPAC |
| 101 | HBFP-44005 | 5 | 96906 | MS-24693-03 | 4-40 X 5/16 FLAT |
| 102 | HBPP-44005 | 23 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 103 | HWFS-40400 | 23 | 96906 | MS15795-803 | #4 X 1/4 FLAT WASHER |
| 104 | HWSS-40300 | 23 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 105 | HNKS-44004 | 4 | 96906 | MS35649-*** | 4-40 KEP NUT |
| 108 | HBFP-25602 | 2 | 96906 | MS-24693-16 | 2-56 X 1/8 FLAT HEAD |
| 109 | HBFP-44007 | 2 | 96906 | MS-24693-05 | 4-40 X 7/16 FLAT |
| A 20 | 120BA01401 | 1 | 58900 | 120BA01401 | DISPLAY DRIVER PCA |
| A 103 | 120BA05500 | 1 | 58900 | 120BA05500 | 11 DIGIT DISPLAY PCA |
| A 104 | 120BA05600 | 1 | 58900 | 120BA05600 | 5 & 9 DIGIT DISPLAY PCA |
| A 105 | 120BA04801 | 1 | 58900 | 120BA04801 | PUSHBUTTON BD M7200 PCA |
| A 106 | 120BA01511 | 1 | 58900 | 120BA01511 | DATA ENTRY M7300 PCA |

### Parts List for 120BA10201 OPT ENCODER HARNESS ASSY Rev B

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | SROE-00100 | 1 | 91506 | ENAIJ-B20-L00100 | ROTARY OPTICAL ENCODER |
| 2 | JIB1-05250 | 1 | 27264 | 22-01-3057 | 5 PIN END CONN SHELL |
| 3 | 120AW10201 | Ref | 58900 | 120AW10201 | OPT ENCODER W/L |
| 4 | JIPF-00001 | 4 | 27264 | 08-55-0102 | END CONNECTOR CONTACT |

### Parts List for 120BA14000 8 CONN MTG PLATE ASY Rev B

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120BF14000 | 1 | 58900 | 120BF14000 | 8 CONNECTOR MTG PLATE |
| 2 | HLLT-K1114 | 4 | 79963 | 814 | 3/8' (BNC) SOLDER LUG |
| 3 | 120AW14000 | Ref | 58900 | 120AW14000 | 8 CONNECTOR PLATE W/L |
| 4 | HPM0-00375 | 1 | 83330 | 652 | 3/8' HOLE PLUG |
| J 1 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 2 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 3 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 4 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 5 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 6 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 7 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |

**Parts List for 120CA16400 M7XXX FRONT PANEL OUT Rev B**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CA15305 | 1 | 58900 | 120CA15305 | .141 CABLE #5 ASY |
| 2 | 107BF01700 | Ref | 58900 | 107BF01700 | SMA CONNECTOR MOUNT FLAN |
| 3 | 107BF01701 | Ref | 58900 | 107BF01701 | SMA CONNECTOR MOUNT SPAC |
| 4 | JRAB-00200 | Ref | 93459 | 9934-3 | SMA F BULK MT CONN |

**Parts List for 120CA16410 M7XXX 40 GHZ FR PNL OUT Rev A**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | JRXA-00300 | 1 | 20944 | K220 | K MALE TO K MALE CONNCTR |
| 2 | 420BF11500 | 1 | 58900 | 420BF11500 | K CONNECTOR MT; M7XXX |
| 3 | 420BF11600 | 1 | 58900 | 420BF11600 | K CONNECTOR SPACER; M7XX |
| 4 | JRKB-00000 | 1 | 98291 | 030-675-0000-89 | BULKHEAD K F-F ADAPTOR |
| 101 | HNKS-44004 | 4 | 96906 | MS35649-*** | 4-40 KEP NUT |

**Parts List for 120DA00902 CHASSIS ASSY Rev B**

| Item | Part Number | Qty | CAGE | Mfr’s Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120DF03700 | 2 | 58900 | 120DF03700 | SIDE GUSSET |
| 2 | 120DF03601 | 1 | 58900 | 120DF03601 | COMPUTER CHASSIS 7XXX |
| 3 | 120CF01700 | 1 | 58900 | 120CF01700 | CARDCAGE REAR WALL |
| 4 | 120CF02100 | 1 | 58900 | 120CF02100 | CARDCAGE FRONT WALL |
| 5 | 120DF02400 | 1 | 58900 | 120DF02400 | CHASSIS SUPPORT |
| 6 | 120CF05000 | 1 | 58900 | 120CF05000 | I/O CARDCAGE - REAR WAL |
| 7 | 120CF05100 | 1 | 58900 | 120CF05100 | I/O CARDCAGE -FRONT WAL |
| 8 | 120CC08901 | 1 | 58900 | 120CC08901 | POWER TRANSFORMER 7XXX |
| 9 | 120CC09000 | 1 | 58900 | 120CC09000 | HI STAB TRANSFORMER |
| 10 | JPS0-20006 | 1 | 31781 | 307-012-500-202 | 12 PIN PC EDGE CONN |
| 13 | 120BA13600 | 1 | 58900 | 120BA13600 | RECTIFIER ASY |
| 14 | 120DA11001 | 1 | 58900 | 120DA11001 | REAR PANEL ASY |
| 15 | HGP1-02500 | 21 | 07556 | 2500-38-4 | 2.5’ DEEP CARD GUIDE |
| 16 | HGP1-04125 | 17 | 07556 | RAD4125 | 4.125’ DEEP CARD GUIDE |
| 17 | 120BA10300 | 1 | 58900 | 120BA10300 | I/O BUSS RIBBON CBL ASY |
| 18 | JIB1-04250 | 1 | 27264 | 22-01-3047 | 4 PIN END CONN SHELL |
| 19 | JIB1-10250 | 1 | 27264 | 22-01-3107 | 10 PIN END CONN SHELL |
| 20 | HIGR-00437 | 1 | 06540 | 1155A | 7/16’ GROMMET |
| 22 | 120BF13100 | 1 | 58900 | 120BF13100 | MAIN TUNE XSTR MTG. BAR |
| 23 | QBNP-06486 | 4 | 04713 | 2N6486 | 15A POWER TRANSISTOR |
| 24 | HQIS-01260 | 4 | 55285 | 7403-09FR-51 | TO126 INSULATOR |
| 25 | HQWN-02200 | 4 | 04713 | B51547F019 | TO220 SHOULDER WASHER |
| 26 | URC0-07824 | 1 | 04713 | MC7824CT | MC7824CT 1A 24V REG |
| 28 | GFU0-00804 | 8 | 20999 | 03318 | ADH TAPE .5W X .25 THICK |
| 29 | HQWC-01260 | 4 | 04713 | B52200F006 | TO126 DOME WASHER |
| 30 | WKA0-25000 | 30 | 92194 | FIT-221-1/4 | 1/4’ SHRINK TUBING |
| 39 | 120BS05400 | Ref | 58900 | 120BS05400 | POWER SUPPLY #2 SCH |
| 43 | 120AW00700 | Ref | 58900 | 120AW00700 | STANDARD PCB W/L |
| 44 | 120AW00902 | Ref | 58900 | 120AW00902 | CHASSIS W/L |
| 45 | 120AW01000 | Ref | 58900 | 120AW01000 | COMPUTER BUS BD. W/L |
| 46 | 120AW07900 | Ref | 58900 | 120AW07900 | DETECTOR BUFFER MODULE W |
| 47 | 120AW11001 | Ref | 58900 | 120AW11001 | REAR PANEL W/L |
| 48 | 120AW11500 | Ref | 58900 | 120AW11500 | 100 MHZ MODULE W/L |
| 50 | 101BA44015 | 1 | 58900 | 101BA44015 | 188;SMB-F RA,SMA-M RA;15 |
| 51 | 101BA48006 | 2 | 58900 | 101BA48006 | 196;2 SMB-F RA; 6’ |
| 52 | 101BA48009 | 1 | 58900 | 101BA48009 | 196; 2 SMB-F RA; 9’ |
| 53 | 101BA48010 | 2 | 58900 | 101BA48010 | 196; 2 SMB-F RA; 10’ |
| 54 | 101BA48012 | 1 | 58900 | 101BA48012 | 196; 2 SMB-F RA; 12’ |
| 55 | 101BA48110 | 1 | 58900 | 101BA48110 | 196; SMB-F RA, CUT; 10’ |
| 56 | 101BA48125 | 6 | 58900 | 101BA48125 | 196; SMB-F RA, CUT; 25’ |
| 57 | 101BA48127 | 1 | 58900 | 101BA48127 | 196; SMB-F RA, CUT; 27’ |
| 58 | 101BA48148 | 1 | 58900 | 101BA48148 | 196; SMB-F RA, CUT; 48’ |
| 59 | 101BA48205 | 2 | 58900 | 101BA48205 | 196; SMB-F RA, SMC-F; 5’ |
| 60 | 101BA48210 | 1 | 58900 | 101BA48210 | 196; SMB-F,SMC-F RA; 10’ |
| 61 | JIPF-00001 | 9 | 27264 | 08-55-0102 | END CONNECTOR CONTACT |
| 62 | 420BF09200 | 1 | 58900 | 420BF09200 | TRANSFORMER SHIELD 7XXX |
| 63 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| 102 | HBPP-44004 | 13 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |
| 103 | HBPP-44006 | 1 | 96906 | MS-51957-15 | 4-40 X 3/8 PAN |
| 106 | HBPP-63206 | 5 | 96906 | MS-51957-28 | 6-32 X 3/8 PAN |
| 107 | HBPP-63204 | 8 | 96906 | MS-51957-26 | 6-32 X 1/4 PAN |
| 108 | HBFP-63204 | 47 | 96906 | MS-24693-24 | 6-32 X 1/4 FLAT |
| 109 | HBFP-63205 | 6 | 96906 | MS-24693-25 | 6-32 X 5/16 FLAT |
| 110 | HBPP-83206 | 2 | 96906 | MS-51957-43 | 8-32 X 3/8 PAN |
| 111 | HWSS-40300 | 16 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 112 | HWSS-60400 | 8 | 96906 | MS35338-136 | #6 X 1/4 SPLIT LOCK |
| 113 | HWSS-80400 | 7 | 96906 | MS35338-137 | #8 X 1/4 SPLIT LOCK |

**Parts List for 120DA00902 CHASSIS ASSY Rev B**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 114 | HWFS-40400 | 19 | 96906 | MS15795-803 | #4 X 1/4 FLAT WASHER |
| 115 | HWFS-60500 | 6 | 96906 | MS15795-805 | #6 X 5/16 FLAT WASHER |
| 116 | HWFS-80600 | 3 | 96906 | MS15795-807 | #8 X 3/8 FLAT WASHER |
| 117 | HNKS-44004 | 2 | 96906 | MS35649-*** | 4-40 KEP NUT |
| 118 | HTM0-00001 | 2 | 06383 | TA1S8 | ANCHOR MOUNT |
| 119 | HTM0-00002 | 2 | 06383 | TM2S8 | TIE MOUNT |
| 120 | HNKS-63204 | 2 | 96906 | MS35649-*** | 6-32 KEP NUT |
| 121 | HNSS-44004 | 1 | 96906 | MS35649-244 | 4-40 HEX NUT |
| 123 | HBPP-44009 | 6 | 96906 | MS-51957-120 | 4-40 X 9/16 PAN |
| 124 | HLLT-60212 | 1 | 79963 | 505-#6 | #6 SOLDER LUG |
| 125 | HIGP-00090 | 1 | 65664 | WG201 | FLEXIBLE GROMMET |
| 126 | HLLT-40210 | 2 | 79963 | 505-#4 | #4 SOLDER LUG |
| 127 | HSDH-80406 | 2 | 55566 | 4620-832-SS-0 | 8-32 X 1/4 M/F SPACER |
| 128 | HBPP-83205 | 3 | 96906 | MS-51957-42 | 8-32 X 5/16 PAN |
| 129 | HBPP-44008 | 2 | 96906 | MS-51957-17 | 4-40 X 1/2 PAN |
| 130 | HBPP-63209 | 4 | 96906 | MS-51957-123 | 6-32 X 9/16 PAN |
| A 11 | 120BA04601 | 1 | 58900 | 120BA04601 | POWER SUPPLY PCA |
| A 100 | 120BA01000 | 1 | 58900 | 120BA01000 | COMPUTER BUS PCA |
| A 101 | 120BA07300 | 1 | 58900 | 120BA07300 | I/O BUSS PCA |
| A 102 | 120CA04200 | 1 | 58900 | 120CA04200 | CAPACITOR ASSY |
| A 107 | 120BA12900 | 1 | 58900 | 120BA12900 | MAIN TUNE PCA |

### Parts List for 120BA13600 RECTIFIER ASY Rev A2

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120BF12300 | 1 | 58900 | 120BF12300 | RECTIFIER MOUNT |
| 2 | DBMC-00100 | 3 | 16352 | 10SB100 | 10 A 100 VRMS BRIDGE |
| 101 | HBPP-63207 | 3 | 96906 | MS-51957-29 | 6-32 X 7/16 PAN |
| 102 | HWSS-60400 | 3 | 96906 | MS35338-136 | #6 X 1/4 SPLIT LOCK |
| 103 | HWFS-60500 | 3 | 96906 | MS15795-805 | #6 X 5/16 FLAT WASHER |

### Parts List for 120DA11001 REAR PANEL ASY Rev A

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 10 | 120DF03500 | 1 | 58900 | 120DF03500 | REAR PANEL |
| 11 | JLFF-06250 | 1 | 05245 | 6J4 | LINE FILTER/CONNEC |
| 12 | FSAC-00400 | 1 | 75915 | 313004 | 4A SB FUSE 3AG |
| 13 | HLLT-K1114 | 4 | 79963 | 814 | 3/8' (BNC) SOLDER LUG |
| 15 | BHG0-05000 | 1 | 23936 | 5504 | 5' FAN FINGER GUARD |
| 16 | 120BA14200 | 1 | 58900 | 120BA14200 | IEEE INTERFACE CABLE ASY |
| 17 | 101BF23401 | 1 | 58900 | 101BF23401 | BLOCK OFF PLATE, 36 PIN |
| 18 | 120DA06401 | 1 | 58900 | 120DA06401 | HEATSINK ASSY |
| 19 | BHS0-03000 | 1 | 82877 | LZ60-8 | 3.3' FAN SCREEN |
| 20 | BHG0-03000 | 1 | 82877 | LZ22N-1 | 3' FAN FINGER GUARD |
| 21 | 120BF16900 | 2 | 58900 | 120BF16900 | HANDLE |
| 22 | JLFL-01506 | 1 | 05245 | 85-1506 | 4A 120V LABEL |
| 101 | HBPP-44004 | 2 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |
| 102 | HWSS-40300 | 2 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 103 | HBPP-63208 | 8 | 96906 | MS-51957-30 | 6-32 X 1/2 PAN |
| 104 | HWSS-60400 | 8 | 96906 | MS35338-136 | #6 X 1/4 SPLIT LOCK |
| 105 | HWFS-60500 | 8 | 96906 | MS15795-805 | #6 X 5/16 FLAT WASHER |
| 106 | HBPP-83207 | 4 | 96906 | MS-51957-44 | 8-32 X 7/16 PAN |
| 107 | HWSS-80400 | 4 | 96906 | MS35338-137 | #8 X 1/4 SPLIT LOCK |
| J 1 | HPM0-00375 | 1 | 83330 | 652 | 3/8' HOLE PLUG |
| J 2 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 3 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 4 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 5 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 6 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 7 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |
| J 8 | JRDF-00001 | 1 | 02660 | 31-221 | BNC F PANEL MOUNT |

**Parts List for 120DA06401 HEATSINK ASSY Rev A**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS05400 | Ref | 58900 | 120BS05400 | POWER SUPPLY #2 SCH |
| 1 | 120CF04000 | 2 | 58900 | 120CF04000 | POWER SUPPLY HEATSINK |
| 2 | 120CF03800 | 1 | 58900 | 120CF03800 | FAN SHROUD, RIGHT SIDE |
| 3 | 120CF03900 | 1 | 58900 | 120CF03900 | FAN SHROUD, LEFT SIDE |
| 4 | BD00-15024 | 1 | 23936 | A31257-10A | 2AVDC 4 5/8' FAN |
| 5 | HIGR-00437 | 6 | 06540 | 1155A | 7/16' GROMMET |
| 6 | HSCR-60404 | 4 | 06540 | 9224A140 | #6 X 1/4 CLEAR SPACER |
| 7 | JSS0-30003 | 7 | 06776 | MD3452-G | TO3 SOCKET |
| 8 | HQIS-00030 | 4 | 55285 | K4-05 | TO3 INSULATOR |
| 9 | 120BF13000 | 2 | 58900 | 120BF13000 | FAN SHROUD COVER |
| 11 | 120AW06401 | Ref | 58900 | 120AW06401 | HEATSINK W/L |
| 101 | HBFP-44004 | 8 | 96906 | MS-24693-02 | 4-40 X 1/4 FLAT |
| 102 | HBPP-44006 | 7 | 96906 | MS-51957-15 | 4-40 X 3/8 PAN |
| 103 | HBFP-63204 | 8 | 96906 | MS-24693-24 | 6-32 X 1/4 FLAT |
| 104 | HBPP-63204 | 2 | 96906 | MS-51957-26 | 6-32 X 1/4 PAN |
| 105 | HBPP-63210 | 14 | 96906 | MS-51957-31 | 6-32 X 5/8 PAN |
| 106 | HWSS-40300 | 6 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 107 | HWFS-40500 | 1 | 96906 | MS15795-804 | #4 X 5/16 FLAT WASHER |
| 108 | HWSS-60400 | 16 | 96906 | MS35338-136 | #6 X 1/4 SPLIT LOCK |
| 109 | HWFS-60600 | 10 | 96906 | MS15795-806 | #6 X 3/8 FLAT WASHER |
| 110 | HNKS-63204 | 4 | 96906 | MS35649-*** | 6-32 KEP NUT |
| 111 | HLLT-40210 | 5 | 79963 | 505-#4 | #4 SOLDER LUG |
| 112 | HBPP-44004 | 4 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |
| 113 | HWFS-40400 | 6 | 96906 | MS15795-803 | #4 X 1/4 FLAT WASHER |
| C 6 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 7 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 8 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 9 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 10 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 11 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 12 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 13 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 14 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 15 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 16 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 17 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 18 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 19 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 20 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 21 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 22 | CE25-R7100 | 1 | 00656 | AMR101M025 | 100 UF 25V RADIAL LEAD |
| C 23 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 24 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 25 | CE25-R7100 | 1 | 00656 | AMR101M025 | 100 UF 25V RADIAL LEAD |
| Q 1 | QBNP-05881 | 1 | 04713 | 2N5881 | 2N5881 15A 60V 160W NPN |
| R 2 | RN55-12490 | 1 | 81349 | RN55C2491F | 2.49 K OHMS 1% MET FILM |
| R 3 | RN55-01500 | 1 | 81349 | RN55C1500F | 150 OHMS 1% MET FILM |
| R 4 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |
| R 5 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |
| RL 1 | SEW0-00302 | 1 | 94696 | W388CQX-11 | RELAY;3PDT;24VDC |
| U 1 | URK0-03500 | 1 | 27014 | LM350K | LM350K 3A ADJ REGULATOR |
| U 2 | URK0-78150 | 1 | 04713 | MC78T15CK | MC78T15;+15V;3A;TO-3;REG |
| U 3 | URK0-79150 | 1 | 04713 | MC7915CK | MC7915CK 1A -15V REG |
| U 4 | URK0-03230 | 1 | 04713 | LM323K | LM323K 5V 3A TO3 REGULAT |
| U 5 | URK0-79052 | 1 | 0KS30 | SG79052K | SG7905.2K 1.5A -5.2V VR |
| U 6 | URK0-01003 | 1 | 64155 | LT1003MK | LT1003MK;+5V;5A;TO-3;REG |

**Parts List for 120DA00631 .01-20 GHz FREQ ASY Rev C**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 004BA31300 | 1 | 58900 | 004BA31300 | 8-20GHZ AMP/LVL/MODULATO |
| 2 | 004BA28500 | 1 | 58900 | 004BA28500 | O/P SWITCH F ASY M7XXX |
| 3 | 004BA30800 | 1 | 58900 | 004BA30800 | 2-8 LEV/MOD/AMO ASSY |
| 4 | 004BA28700 | 1 | 58900 | 004BA28700 | REF COUPLER N M7XXX ASY |
| 5 | 004BA28800 | 1 | 58900 | 004BA28800 | REF SWITCH N M7XXX ASY |
| 6 | 120AW00603 | Ref | 58900 | 120AW00603 | 2-20 FREQUENCY ASSY W/L |
| 7 | 120AW00601 | Ref | 58900 | 120AW00601 | .01-2 FREQUENCY W/L |
| 9 | MPB0-02001 | 1 | 28480 | HP33322H-H89/016 | PGM ATTEN;0-110dB;20GHz |
| 10 | MCD0-00220 | 1 | 62331 | 202020010E | 2-20 GHZ DIR DET/REF |
| 11 | JRAT-00000 | 5 | 95077 | 2998-6001 | SMA CAP |
| 12 | JRAT-00050 | 1 | 16179 | 2001-6113-00 | 50 OHM SMA TERMINATION |
| 13 | MMDC-00126 | 1 | 99899 | 80014 | 2-26 GHZ 500 MHZ IF MIX |
| 14 | MOYT-10820 | 1 | 24539 | Y091-2804 | 8-20 GHz YIG XSTR OSC |
| 15 | MOYT-00209 | 2 | 24539 | S080-1342 | 1.9-8.7 GHZ YIG XSTR OSC |
| 16 | 120DF08400 | 1 | 58900 | 120DF08400 | MICROWAVE CHASSIS |
| 20 | LFT0-83208 | 11 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| 21 | LFT1-83208 | 4 | 59660 | 4205-022-S | FEED-THRU FILTER 15A |
| 22 | JRAB-18200 | 3 | 98291 | 50-675-0000-31 | SMA F BULK MT CONN |
| 23 | 420BF22800 | 1 | 58900 | 420BF22800 | 2-8 MODULE HEATSINK'M7XX |
| 24 | 420BF38100 | 1 | 58900 | 420BF38100 | 8-20 MTG BRACKET A;M7XXX |
| 25 | 420BF38200 | 1 | 58900 | 420BF38200 | 8-20 MTG BRACKET B;M7XXX |
| 26 | 120BF07600 | 1 | 58900 | 120BF07600 | O/P SWITCH MOUNT |
| 27 | 420CF22900 | 1 | 58900 | 420CF22900 | 2-8 MODULE MOUNT M7XXX |
| 28 | 120BF07700 | 1 | 58900 | 120BF07700 | REF SWITCH MOUNT |
| 29 | 120BF08000 | 1 | 58900 | 120BF08000 | ATTENUATOR MOUNT |
| 30 | 120BF08200 | 1 | 58900 | 120BF08200 | DIRECTIONAL DETECTOR MNT |
| 34 | 120BF14500 | 1 | 58900 | 120BF14500 | REF. COUPLER MOUNT |
| 35 | 120BF14600 | 1 | 58900 | 120BF14600 | MIXER MOUNT |
| 41 | JRAA-00201 | 2 | 16179 | 20875005-00 | SMA M-M SWEPT RT ANGLE |
| 42 | JRAA-00200 | 4 | 98291 | 50-673-0159-31 | SMA M TO SMA M ADAPT |
| 44 | 120CF12400 | 1 | 58900 | 120CF12400 | DOWNCONVERTER MOUNT |
| 45 | DPAB-05391 | 3 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| 46 | RN55-00150 | 3 | 81349 | RN55C15R0F | 15 OHMS 1% MET FILM |
| 47 | LAD0-07100 | 1 | 72259 | WEE-100 | 100 UH INDUCTOR |
| 48 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| 49 | 120CA15222 | 1 | 58900 | 120CA15222 | S/R .085 CABLE #V 7XXX A |
| 50 | 120CA15224 | 1 | 58900 | 120CA15224 | S/R .085 CABLE #X ASY |
| 51 | 120CA15205 | 1 | 58900 | 120CA15205 | .085 CABLE #E ASY |
| 52 | 120CA15334 | 1 | 58900 | 120CA15334 | S/R .141 CABLE #34 7XXX |
| 53 | 120CA15304 | 1 | 58900 | 120CA15304 | .141 CABLE #4 ASY |
| 54 | 120CA15305 | 1 | 58900 | 120CA15305 | .141 CABLE #5 ASY |
| 55 | 120CA15306 | 2 | 58900 | 120CA15306 | .141 CABLE #6 ASY |
| 56 | WCAS-18004 | 1 | 64023 | 1-3636-600-5204 | 4' 26 GHz SEMI-FLEX COAX |
| 57 | 120CA15340 | 1 | 58900 | 120CA15340 | S/R .141 CABLE #40 ASY |
| 58 | MDS0-00002 | 1 | 62331 | 301E | .01-20GHz SMA DETECTOR |
| 65 | 120CA15210 | 1 | 58900 | 120CA15210 | .085 CABLE #J ASY |
| 66 | 120CA15211 | 1 | 58900 | 120CA15211 | .085 CABLE #K ASY |
| 67 | 120CA15223 | 1 | 58900 | 120CA15223 | S/R .085 CABLE #W ASY |
| 68 | 120CA15216 | 1 | 58900 | 120CA15216 | .085 CABLE #P |
| 69 | 120CA15213 | 1 | 58900 | 120CA15213 | .085 CABLE #M ASY |
| 70 | 120CA15218 | 1 | 58900 | 120CA15218 | .085 M/RT ANGLE #R |
| 71 | 420BF38800 | 1 | 58900 | 420BF38800 | SMA SPACER; M7XXX |
| 102 | HBPP-25604 | 1 | 96906 | MS-51957-3 | 2-56 X 1/4 PAN |
| 104 | HBFP-44003 | 3 | 96906 | MS-24693-01 | 4-40 X 3/16 FLAT |
| 105 | HBFP-44004 | 4 | 96906 | MS-24693-02 | 4-40 X 1/4 FLAT |
| 106 | HBPP-44004 | 10 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |
| 107 | HBFP-44005 | 4 | 96906 | MS-24693-03 | 4-40 X 5/16 FLAT |

**Parts List for 120DA00631 .01-20 GHz FREQ ASY Rev C**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 108 | HBPP-44005 | 6 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 110 | HBPP-63204 | 27 | 96906 | MS-51957-26 | 6-32 X 1/4 PAN |
| 112 | HBPP-63205 | 4 | 96906 | MS-51957-27 | 6-32 X 5/16 PAN |
| 116 | HWFS-40500 | 3 | 96906 | MS15795-804 | #4 X 5/16 FLAT WASHER |
| 117 | HWFS-60500 | 9 | 96906 | MS15795-805 | #6 X 5/16 FLAT WASHER |
| 118 | HWSS-20200 | 1 | 96906 | MS35338-134 | #2 X 1/8 SPLIT LOCK |
| 119 | HWSS-40300 | 22 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 120 | HWSS-60400 | 29 | 96906 | MS35338-136 | #6 X 1/4 SPLIT LOCK |
| 122 | HLLT-80212 | 4 | 79963 | 505-#8 | #8 SOLDER LUG |
| 123 | HNKS-44004 | 1 | 96906 | MS35649-*** | 4-40 KEP NUT |
| 124 | HNKS-63204 | 2 | 96906 | MS35649-*** | 6-32 KEP NUT |
| 125 | HBPP-44012 | 3 | 96906 | MS-51957-19 | 4-40 X 3/4 PAN |
| 126 | HBPP-44018 | 3 | 96906 | MS-51957-121 | 4-40 X 1 1/8 PAN |
| 127 | HNSS-44004 | 1 | 96906 | MS35649-244 | 4-40 HEX NUT |
| A 200 | 120BA07900 | 1 | 58900 | 120BA07900 | DETECTOR BUFFER PCA |
| A 201 | 120CA11500 | 1 | 58900 | 120CA11500 | 100MHz MODULE ASY |
| A 202 | 004CA09103 | 1 | 58900 | 004CA09103 | DWN CONV/W CNTR M7XXX AS |
| A 203 | 120BA13500 | 1 | 58900 | 120BA13500 | COUPLER |
| A 204 | 004BA16700 | 1 | 58900 | 004BA16700 | .01-2 MIXER/AMP M7X00 |
| R 1 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 2 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 3 | RW25-00050 | 1 | 15915 | TM25-5 OHM-1%Y | 5 OHM 25W KELVIN LEAD |

**Parts List for 120DA00603 2-20 GHz FREQ ASY Rev B**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 004BA31300 | 1 | 58900 | 004BA31300 | 8-20GHZ AMP/LVL/MODULATO |
| 2 | 004BA28500 | 1 | 58900 | 004BA28500 | O/P SWITCH F ASY M7XXX |
| 3 | 004BA30800 | 1 | 58900 | 004BA30800 | 2-8 LEV/MOD/AMO ASSY |
| 4 | 004BA28700 | 1 | 58900 | 004BA28700 | REF COUPLER N M7XXX ASY |
| 5 | 004BA28800 | 1 | 58900 | 004BA28800 | REF SWITCH N M7XXX ASY |
| 6 | 120AW00603 | Ref | 58900 | 120AW00603 | 2-20 FREQUENCY ASSY W/L |
| 9 | MPB0-02001 | 1 | 28480 | HP33322H-H89/016 | PGM ATTEN;0-110dB;20GHz |
| 10 | MCD0-00220 | 1 | 62331 | 202020010E | 2-20 GHZ DIR DET/REF |
| 11 | JRAT-00000 | 8 | 95077 | 2998-6001 | SMA CAP |
| 12 | JRAT-00050 | 1 | 16179 | 2001-6113-00 | 50 OHM SMA TERMINATION |
| 13 | MMDC-00126 | 1 | 99899 | 80014 | 2-26 GHZ 500 MHZ IF MIX |
| 14 | MOYT-10820 | 1 | 24539 | Y091-2804 | 8-20 GHz YIG XSTR OSC |
| 15 | MOYT-00209 | 2 | 24539 | S080-1342 | 1.9-8.7 GHZ YIG XSTR OSC |
| 16 | 120DF08400 | 1 | 58900 | 120DF08400 | MICROWAVE CHASSIS |
| 20 | LFT0-83208 | 11 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| 21 | LFT1-83208 | 4 | 59660 | 4205-022-S | FEED-THRU FILTER 15A |
| 22 | JRAB-18200 | 3 | 98291 | 50-675-0000-31 | SMA F BULK MT CONN |
| 23 | 420BF22800 | 1 | 58900 | 420BF22800 | 2-8 MODULE HEATSINK'M7XX |
| 24 | 420BF38100 | 1 | 58900 | 420BF38100 | 8-20 MTG BRACKET A;M7XXX |
| 25 | 420BF38200 | 1 | 58900 | 420BF38200 | 8-20 MTG BRACKET B;M7XXX |
| 26 | 120BF07600 | 1 | 58900 | 120BF07600 | O/P SWITCH MOUNT |
| 27 | 420CF22900 | 1 | 58900 | 420CF22900 | 2-8 MODULE MOUNT M7XXX |
| 28 | 120BF07700 | 1 | 58900 | 120BF07700 | REF SWITCH MOUNT |
| 29 | 120BF08000 | 1 | 58900 | 120BF08000 | ATTENUATOR MOUNT |
| 30 | 120BF08200 | 1 | 58900 | 120BF08200 | DIRECTIONAL DETECTOR MNT |
| 34 | 120BF14500 | 1 | 58900 | 120BF14500 | REF. COUPLER MOUNT |
| 35 | 120BF14600 | 1 | 58900 | 120BF14600 | MIXER MOUNT |
| 41 | JRAA-00201 | 2 | 16179 | 20875005-00 | SMA M-M SWEPT RT ANGLE |
| 42 | JRAA-00200 | 4 | 98291 | 50-673-0159-31 | SMA M TO SMA M ADAPT |
| 43 | 101BA41700 | 1 | 58900 | 101BA41700 | 100MHz MOUNT ASY |
| 44 | 120CF12400 | 1 | 58900 | 120CF12400 | DOWNCONVERTER MOUNT |
| 45 | DPAB-05391 | 3 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| 46 | RN55-00150 | 3 | 81349 | RN55C15R0F | 15 OHMS 1% MET FILM |
| 47 | LAD0-07100 | 1 | 72259 | WEE-100 | 100 UH INDUCTOR |
| 48 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| 49 | 120CA15222 | 1 | 58900 | 120CA15222 | S/R .085 CABLE #V 7XXX A |
| 50 | 120CA15224 | 1 | 58900 | 120CA15224 | S/R .085 CABLE #X ASY |
| 51 | 120CA15205 | 1 | 58900 | 120CA15205 | .085 CABLE #E ASY |
| 52 | 120CA15334 | 1 | 58900 | 120CA15334 | S/R .141 CABLE #34 7XXX |
| 53 | 120CA15304 | 1 | 58900 | 120CA15304 | .141 CABLE #4 ASY |
| 54 | 120CA15305 | 1 | 58900 | 120CA15305 | .141 CABLE #5 ASY |
| 55 | 120CA15306 | 2 | 58900 | 120CA15306 | .141 CABLE #6 ASY |
| 56 | WCAS-18004 | 1 | 64023 | 1-3636-600-5204 | 4' 26 GHz SEMI-FLEX COAX |
| 57 | 120CA15340 | 1 | 58900 | 120CA15340 | S/R .141 CABLE #40 ASY |
| 58 | 420BF38800 | 1 | 58900 | 420BF38800 | SMA SPACER; M7XXX |
| 102 | HBPP-25604 | 1 | 96906 | MS-51957-3 | 2-56 X 1/4 PAN |
| 103 | HBPP-25605 | 2 | 96906 | MS-51957-4 | 2-56 X 5/16 PAN |
| 104 | HBFP-44003 | 3 | 96906 | MS-24693-01 | 4-40 X 3/16 FLAT |
| 106 | HBPP-44004 | 10 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |
| 107 | HBFP-44005 | 4 | 96906 | MS-24693-03 | 4-40 X 5/16 FLAT |
| 108 | HBPP-44005 | 6 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 110 | HBPP-63204 | 25 | 96906 | MS-51957-26 | 6-32 X 1/4 PAN |
| 112 | HBPP-63205 | 4 | 96906 | MS-51957-27 | 6-32 X 5/16 PAN |
| 116 | HWFS-40500 | 3 | 96906 | MS15795-804 | #4 X 5/16 FLAT WASHER |
| 117 | HWFS-60500 | 9 | 96906 | MS15795-805 | #6 X 5/16 FLAT WASHER |
| 118 | HWSS-20200 | 3 | 96906 | MS35338-134 | #2 X 1/8 SPLIT LOCK |
| 119 | HWSS-40300 | 22 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |

**Parts List for 120DA00603 2-20 GHz FREQ ASY Rev B**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 120 | HWSS-60400 | 27 | 96906 | MS35338-136 | #6 X 1/4 SPLIT LOCK |
| 122 | HLLT-80212 | 4 | 79963 | 505-#8 | #8 SOLDER LUG |
| 123 | HNKS-44004 | 1 | 96906 | MS35649-*** | 4-40 KEP NUT |
| 124 | HNKS-63204 | 2 | 96906 | MS35649-*** | 6-32 KEP NUT |
| 125 | HBPP-44012 | 3 | 96906 | MS-51957-19 | 4-40 X 3/4 PAN |
| 126 | HBPP-44018 | 3 | 96906 | MS-51957-121 | 4-40 X 1 1/8 PAN |
| 127 | HNSS-44004 | 1 | 96906 | MS35649-244 | 4-40 HEX NUT |
| A 200 | 120BA07900 | 1 | 58900 | 120BA07900 | DETECTOR BUFFER PCA |
| A 201 | 120CA11500 | 1 | 58900 | 120CA11500 | 100MHz MODULE ASY |
| R 1 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 2 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 3 | RW25-00050 | 1 | 15915 | TM25-5 OHM-1%Y | 5 OHM 25W KELVIN LEAD |

**Parts List for 120DA00611 .01-26 GHz FREQ ASY Rev D**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 004BA31300 | 1 | 58900 | 004BA31300 | 8-20GHZ AMP/LVL/MODULATO |
| 2 | 004BA28500 | 1 | 58900 | 004BA28500 | O/P SWITCH F ASY M7XXX |
| 3 | 004BA30800 | 1 | 58900 | 004BA30800 | 2-8 LEV/MOD/AMO ASSY |
| 4 | 004BA28700 | 1 | 58900 | 004BA28700 | REF COUPLER N M7XXX ASY |
| 5 | 004BA28800 | 1 | 58900 | 004BA28800 | REF SWITCH N M7XXX ASY |
| 6 | 120AW00603 | Ref | 58900 | 120AW00603 | 2-20 FREQUENCY ASSY W/L |
| 7 | 120AW00601 | Ref | 58900 | 120AW00601 | .01-2 FREQUENCY W/L |
| 8 | 120AW00604 | Ref | 58900 | 120AW00604 | 20-26 FREQ ASSY W/L |
| 9 | MP90-02603 | 1 | 28480 | 33323K-90 | 90DB 26GHZ 10DB STEP ATT |
| 10 | MCD2-00226 | 1 | 62331 | 2611SE | 2-26 GHZ DIR DET/REF |
| 11 | JRAT-00000 | 3 | 95077 | 2998-6001 | SMA CAP |
| 12 | JRAT-00050 | 1 | 16179 | 2001-6113-00 | 50 OHM SMA TERMINATION |
| 13 | MMDC-00126 | 1 | 99899 | 80014 | 2-26 GHZ 500 MHZ IF MIX |
| 14 | MOYT-10820 | 1 | 24539 | Y091-2804 | 8-20 GHz YIG XSTR OSC |
| 15 | MOYT-00209 | 2 | 24539 | S080-1342 | 1.9-8.7 GHZ YIG XSTR OSC |
| 16 | 120DF08400 | 1 | 58900 | 120DF08400 | MICROWAVE CHASSIS |
| 20 | LFT0-83208 | 11 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| 21 | LFT1-83208 | 4 | 59660 | 4205-022-S | FEED-THRU FILTER 15A |
| 22 | JRAB-18200 | 3 | 98291 | 50-675-0000-31 | SMA F BULK MT CONN |
| 23 | 420BF22800 | 1 | 58900 | 420BF22800 | 2-8 MODULE HEATSINK'M7XX |
| 24 | 420BF38100 | 1 | 58900 | 420BF38100 | 8-20 MTG BRACKET A;M7XXX |
| 25 | 420BF38200 | 1 | 58900 | 420BF38200 | 8-20 MTG BRACKET B;M7XXX |
| 26 | 120BF07600 | 1 | 58900 | 120BF07600 | O/P SWITCH MOUNT |
| 27 | 420CF22900 | 1 | 58900 | 420CF22900 | 2-8 MODULE MOUNT M7XXX |
| 28 | 120BF07700 | 1 | 58900 | 120BF07700 | REF SWITCH MOUNT |
| 29 | 120BF08000 | 1 | 58900 | 120BF08000 | ATTENUATOR MOUNT |
| 30 | 120BF08200 | 1 | 58900 | 120BF08200 | DIRECTIONAL DETECTOR MNT |
| 34 | 120BF14500 | 1 | 58900 | 120BF14500 | REF. COUPLER MOUNT |
| 35 | 120BF14600 | 1 | 58900 | 120BF14600 | MIXER MOUNT |
| 41 | JRAA-00201 | 3 | 16179 | 20875005-00 | SMA M-M SWEPT RT ANGLE |
| 42 | JRAA-00200 | 5 | 98291 | 50-673-0159-31 | SMA M TO SMA M ADAPT |
| 44 | 120CF12400 | 1 | 58900 | 120CF12400 | DOWNCONVERTER MOUNT |
| 45 | DPAB-05391 | 4 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| 46 | RN55-00150 | 4 | 81349 | RN55C15R0F | 15 OHMS 1% MET FILM |
| 47 | LAD0-07100 | 1 | 72259 | WEE-100 | 100 UH INDUCTOR |
| 48 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| 49 | 120CA15222 | 1 | 58900 | 120CA15222 | S/R .085 CABLE #V 7XXX A |
| 50 | 120CA15224 | 1 | 58900 | 120CA15224 | S/R .085 CABLE #X ASY |
| 51 | 120CA15205 | 1 | 58900 | 120CA15205 | .085 CABLE #E ASY |
| 52 | 120CA15334 | 1 | 58900 | 120CA15334 | S/R .141 CABLE #34 7XXX |
| 54 | 120CA18320 | 1 | 58900 | 120CA18320 | .118 CABLE #20 ASY |
| 55 | 120CA15306 | 2 | 58900 | 120CA15306 | .141 CABLE #6 ASY |
| 56 | WCAS-18004 | 1 | 64023 | 1-3636-600-5204 | 4' 26 GHz SEMI-FLEX COAX |
| 57 | 120CA15340 | 1 | 58900 | 120CA15340 | S/R .141 CABLE #40 ASY |
| 58 | MDS0-00002 | 1 | 62331 | 301E | .01-20GHz SMA DETECTOR |
| 59 | 120CA18318 | 1 | 58900 | 120CA18318 | .118 CABLE #18 ASY |
| 60 | 120CA15337 | 1 | 58900 | 120CA15337 | S/R .141 CABLE #37 ASY |
| 61 | 120CA18309 | 1 | 58900 | 120CA18309 | .118 CABLE #9 ASY |
| 62 | 120CA18319 | 1 | 58900 | 120CA18319 | .118 CABLE #19 ASY |
| 63 | 120CA18317 | 1 | 58900 | 120CA18317 | .118 CABLE #17 ASY |
| 65 | 004BA33100 | 1 | 58900 | 004BA33100 | AMP/LVL/;MOD ASY 20-26GH |
| 66 | MOYT-L1826 | 1 | 24539 | YO89-4084 | 18-26.5 LO NOISE YIG |
| 67 | JRAB-00200 | 1 | 93459 | 9934-3 | SMA F BULK MT CONN |
| 69 | 120CA15210 | 1 | 58900 | 120CA15210 | .085 CABLE #J ASY |
| 70 | 120CA15211 | 1 | 58900 | 120CA15211 | .085 CABLE #K ASY |
| 71 | 120CA15223 | 1 | 58900 | 120CA15223 | S/R .085 CABLE #W ASY |
| 72 | 120CA15213 | 1 | 58900 | 120CA15213 | .085 CABLE #M ASY |

## Parts List for 120DA00611 .01-26 GHz FREQ ASY Rev D

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 73 | 120CA15216 | 1 | 58900 | 120CA15216 | .085 CABLE #P |
| 74 | 120CA15218 | 1 | 58900 | 120CA15218 | .085 M/RT ANGLE #R |
| 75 | 420BF38800 | 1 | 58900 | 420BF38800 | SMA SPACER; M7XXX |
| 102 | HBPP-25604 | 1 | 96906 | MS-51957-3 | 2-56 X 1/4 PAN |
| 103 | HBPP-25605 | 5 | 96906 | MS-51957-4 | 2-56 X 5/16 PAN |
| 104 | HBFP-44003 | 3 | 96906 | MS-24693-01 | 4-40 X 3/16 FLAT |
| 105 | HBFP-44004 | 4 | 96906 | MS-24693-02 | 4-40 X 1/4 FLAT |
| 106 | HBPP-44004 | 10 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |
| 107 | HBFP-44005 | 4 | 96906 | MS-24693-03 | 4-40 X 5/16 FLAT |
| 108 | HBPP-44005 | 8 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 110 | HBPP-63204 | 31 | 96906 | MS-51957-26 | 6-32 X 1/4 PAN |
| 112 | HBPP-63205 | 4 | 96906 | MS-51957-27 | 6-32 X 5/16 PAN |
| 116 | HWFS-40500 | 3 | 96906 | MS15795-804 | #4 X 5/16 FLAT WASHER |
| 117 | HWFS-60500 | 9 | 96906 | MS15795-805 | #6 X 5/16 FLAT WASHER |
| 118 | HWSS-20200 | 6 | 96906 | MS35338-134 | #2 X 1/8 SPLIT LOCK |
| 119 | HWSS-40300 | 24 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 120 | HWSS-60400 | 33 | 96906 | MS35338-136 | #6 X 1/4 SPLIT LOCK |
| 122 | HLLT-80212 | 4 | 79963 | 505-#8 | #8 SOLDER LUG |
| 123 | HNKS-44004 | 1 | 96906 | MS35649-*** | 4-40 KEP NUT |
| 124 | HNKS-63204 | 2 | 96906 | MS35649-*** | 6-32 KEP NUT |
| 125 | HBPP-44012 | 3 | 96906 | MS-51957-19 | 4-40 X 3/4 PAN |
| 126 | HBPP-44018 | 3 | 96906 | MS-51957-121 | 4-40 X 1 1/8 PAN |
| 127 | HNSS-44004 | 1 | 96906 | MS35649-244 | 4-40 HEX NUT |
| A 200 | 120BA07900 | 1 | 58900 | 120BA07900 | DETECTOR BUFFER PCA |
| A 201 | 120CA11500 | 1 | 58900 | 120CA11500 | 100MHz MODULE ASY |
| A 202 | 004CA09103 | 1 | 58900 | 004CA09103 | DWN CONV/W CNTR M7XXX AS |
| A 203 | 120BA13500 | 1 | 58900 | 120BA13500 | COUPLER |
| A 204 | 004BA16700 | 1 | 58900 | 004BA16700 | .01-2 MIXER/AMP M7X00 |
| R 1 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 2 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 3 | RW25-00050 | 1 | 15915 | TM25-5 OHM-1%Y | 5 OHM 25W KELVIN LEAD |
| R 4 | RW25-00050 | 1 | 15915 | TM25-5 OHM-1%Y | 5 OHM 25W KELVIN LEAD |

### Parts List for 120DA00621 2-26 GHz FREQ ASY Rev C

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 004BA31300 | 1 | 58900 | 004BA31300 | 8-20GHZ AMP/LVL/MODULATO |
| 2 | 004BA28500 | 1 | 58900 | 004BA28500 | O/P SWITCH F ASY M7XXX |
| 3 | 004BA30800 | 1 | 58900 | 004BA30800 | 2-8 LEV/MOD/AMO ASSY |
| 4 | 004BA28700 | 1 | 58900 | 004BA28700 | REF COUPLER N M7XXX ASY |
| 5 | 004BA28800 | 1 | 58900 | 004BA28800 | REF SWITCH N M7XXX ASY |
| 6 | 120AW00603 | Ref | 58900 | 120AW00603 | 2-20 FREQUENCY ASSY W/L |
| 7 | 120AW00604 | Ref | 58900 | 120AW00604 | 20-26 FREQ ASSY W/L |
| 9 | MP90-02603 | 1 | 28480 | 33323K-90 | 90DB 26GHZ 10DB STEP ATT |
| 10 | MCD2-00226 | 1 | 62331 | 2611SE | 2-26 GHZ DIR DET/REF |
| 11 | JRAT-00000 | 7 | 95077 | 2998-6001 | SMA CAP |
| 12 | JRAT-00050 | 1 | 16179 | 2001-6113-00 | 50 OHM SMA TERMINATION |
| 13 | MMDC-00126 | 1 | 99899 | 80014 | 2-26 GHZ 500 MHZ IF MIX |
| 14 | MOYT-10820 | 1 | 24539 | Y091-2804 | 8-20 GHz YIG XSTR OSC |
| 15 | MOYT-00209 | 2 | 24539 | S080-1342 | 1.9-8.7 GHZ YIG XSTR OSC |
| 16 | 120DF08400 | 1 | 58900 | 120DF08400 | MICROWAVE CHASSIS |
| 20 | LFT0-83208 | 11 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| 21 | LFT1-83208 | 4 | 59660 | 4205-022-S | FEED-THRU FILTER 15A |
| 22 | JRAB-18200 | 3 | 98291 | 50-675-0000-31 | SMA F BULK MT CONN |
| 23 | 420BF22800 | 1 | 58900 | 420BF22800 | 2-8 MODULE HEATSINK'M7XX |
| 24 | 420BF38100 | 1 | 58900 | 420BF38100 | 8-20 MTG BRACKET A;M7XXX |
| 25 | 420BF38200 | 1 | 58900 | 420BF38200 | 8-20 MTG BRACKET B;M7XXX |
| 26 | 120BF07600 | 1 | 58900 | 120BF07600 | O/P SWITCH MOUNT |
| 27 | 420CF22900 | 1 | 58900 | 420CF22900 | 2-8 MODULE MOUNT M7XXX |
| 28 | 120BF07700 | 1 | 58900 | 120BF07700 | REF SWITCH MOUNT |
| 29 | 120BF08000 | 1 | 58900 | 120BF08000 | ATTENUATOR MOUNT |
| 30 | 120BF08200 | 1 | 58900 | 120BF08200 | DIRECTIONAL DETECTOR MNT |
| 34 | 120BF14500 | 1 | 58900 | 120BF14500 | REF. COUPLER MOUNT |
| 35 | 120BF14600 | 1 | 58900 | 120BF14600 | MIXER MOUNT |
| 41 | JRAA-00201 | 2 | 16179 | 20875005-00 | SMA M-M SWEPT RT ANGLE |
| 42 | JRAA-00200 | 4 | 98291 | 50-673-0159-31 | SMA M TO SMA M ADAPT |
| 43 | 101BA41700 | 1 | 58900 | 101BA41700 | 100MHz MOUNT ASY |
| 44 | 120CF12400 | 1 | 58900 | 120CF12400 | DOWNCONVERTER MOUNT |
| 45 | DPAB-05391 | 4 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| 46 | RN55-00150 | 4 | 81349 | RN55C15R0F | 15 OHMS 1% MET FILM |
| 47 | LAD0-07100 | 1 | 72259 | WEE-100 | 100 UH INDUCTOR |
| 48 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| 49 | 120CA15222 | 1 | 58900 | 120CA15222 | S/R .085 CABLE #V 7XXX A |
| 50 | 120CA15224 | 1 | 58900 | 120CA15224 | S/R .085 CABLE #X ASY |
| 51 | 120CA15205 | 1 | 58900 | 120CA15205 | .085 CABLE #E ASY |
| 52 | 120CA15334 | 1 | 58900 | 120CA15334 | S/R .141 CABLE #34 7XXX |
| 54 | 120CA18320 | 1 | 58900 | 120CA18320 | .118 CABLE #20 ASY |
| 55 | 120CA15306 | 2 | 58900 | 120CA15306 | .141 CABLE #6 ASY |
| 56 | WCAS-18004 | 1 | 64023 | 1-3636-600-5204 | 4' 26 GHz SEMI-FLEX COAX |
| 57 | 120CA15340 | 1 | 58900 | 120CA15340 | S/R .141 CABLE #40 ASY |
| 59 | 120CA18318 | 1 | 58900 | 120CA18318 | .118 CABLE #18 ASY |
| 60 | 120CA15337 | 1 | 58900 | 120CA15337 | S/R .141 CABLE #37 ASY |
| 61 | 120CA18309 | 1 | 58900 | 120CA18309 | .118 CABLE #9 ASY |
| 62 | 120CA18319 | 1 | 58900 | 120CA18319 | .118 CABLE #19 ASY |
| 63 | 120CA18317 | 1 | 58900 | 120CA18317 | .118 CABLE #17 ASY |
| 65 | 004BA33100 | 1 | 58900 | 004BA33100 | AMP/LVL/;MOD ASY 20-26GH |
| 66 | MOYT-L1826 | 1 | 24539 | YO89-4084 | 18-26.5 LO NOISE YIG |
| 67 | JRAB-00200 | 1 | 93459 | 9934-3 | SMA F BULK MT CONN |
| 69 | 420BF38800 | 1 | 58900 | 420BF38800 | SMA SPACER; M7XXX |
| 102 | HBPP-25604 | 1 | 96906 | MS-51957-3 | 2-56 X 1/4 PAN |
| 103 | HBPP-25605 | 7 | 96906 | MS-51957-4 | 2-56 X 5/16 PAN |
| 104 | HBFP-44003 | 3 | 96906 | MS-24693-01 | 4-40 X 3/16 FLAT |
| 106 | HBPP-44004 | 10 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |

### Parts List for 120DA00621 2-26 GHz FREQ ASY Rev C

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 107 | HBFP-44005 | 4 | 96906 | MS-24693-03 | 4-40 X 5/16 FLAT |
| 108 | HBPP-44005 | 8 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 110 | HBPP-63204 | 29 | 96906 | MS-51957-26 | 6-32 X 1/4 PAN |
| 112 | HBPP-63205 | 4 | 96906 | MS-51957-27 | 6-32 X 5/16 PAN |
| 116 | HWFS-40500 | 3 | 96906 | MS15795-804 | #4 X 5/16 FLAT WASHER |
| 117 | HWFS-60500 | 9 | 96906 | MS15795-805 | #6 X 5/16 FLAT WASHER |
| 118 | HWSS-20200 | 8 | 96906 | MS35338-134 | #2 X 1/8 SPLIT LOCK |
| 119 | HWSS-40300 | 24 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 120 | HWSS-60400 | 31 | 96906 | MS35338-136 | #6 X 1/4 SPLIT LOCK |
| 122 | HLLT-80212 | 4 | 79963 | 505-#8 | #8 SOLDER LUG |
| 123 | HNKS-44004 | 1 | 96906 | MS35649-*** | 4-40 KEP NUT |
| 124 | HNKS-63204 | 2 | 96906 | MS35649-*** | 6-32 KEP NUT |
| 125 | HBPP-44012 | 3 | 96906 | MS-51957-19 | 4-40 X 3/4 PAN |
| 126 | HBPP-44018 | 3 | 96906 | MS-51957-121 | 4-40 X 1 1/8 PAN |
| 127 | HNSS-44004 | 1 | 96906 | MS35649-244 | 4-40 HEX NUT |
| A 200 | 120BA07900 | 1 | 58900 | 120BA07900 | DETECTOR BUFFER PCA |
| A 201 | 120CA11500 | 1 | 58900 | 120CA11500 | 100MHz MODULE ASY |
| R 1 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 2 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 3 | RW25-00050 | 1 | 15915 | TM25-5 OHM-1%Y | 5 OHM 25W KELVIN LEAD |
| R 4 | RW25-00050 | 1 | 15915 | TM25-5 OHM-1%Y | 5 OHM 25W KELVIN LEAD |

**Parts List for 120DA00651 .01-40 GHz FREQ ASY Rev A**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 004BA31300 | 1 | 58900 | 004BA31300 | 8-20GHZ AMP/LVL/MODULATO |
| 2 | 004BA33820 | 1 | 58900 | 004BA33820 | .01-40 SWITCH/FILTER ASY |
| 3 | 004BA30800 | 1 | 58900 | 004BA30800 | 2-8 LEV/MOD/AMO ASSY |
| 4 | 004BA28700 | 1 | 58900 | 004BA28700 | REF COUPLER N M7XXX ASY |
| 5 | 004BA28800 | 1 | 58900 | 004BA28800 | REF SWITCH N M7XXX ASY |
| 6 | 120AW00603 | Ref | 58900 | 120AW00603 | 2-20 FREQUENCY ASSY W/L |
| 7 | 120AW00601 | Ref | 58900 | 120AW00601 | .01-2 FREQUENCY W/L |
| 9 | MP90-04000 | 1 | 28480 | 33326L;OPT006 & 890 | 90dB 40GHZ 10dB STP ATTN |
| 10 | MCD0-00240 | 1 | 62331 | 202040013KE | 2-40 GHZ DIR DET/REF |
| 11 | JRAT-00000 | 5 | 95077 | 2998-6001 | SMA CAP |
| 12 | JRAT-00050 | 1 | 16179 | 2001-6113-00 | 50 OHM SMA TERMINATION |
| 13 | MMDC-00126 | 1 | 99899 | 80014 | 2-26 GHZ 500 MHZ IF MIX |
| 14 | MOYT-10820 | 1 | 24539 | Y091-2804 | 8-20 GHz YIG XSTR OSC |
| 15 | MOYT-00209 | 2 | 24539 | S080-1342 | 1.9-8.7 GHZ YIG XSTR OSC |
| 16 | 120DF08400 | 1 | 58900 | 120DF08400 | MICROWAVE CHASSIS |
| 17 | 420BF38800 | 1 | 58900 | 420BF38800 | SMA SPACER; M7XXX |
| 18 | 420BF22800 | 1 | 58900 | 420BF22800 | 2-8 MODULE HEATSINK'M7XX |
| 19 | 420BF38200 | 1 | 58900 | 420BF38200 | 8-20 MTG BRACKET B;M7XXX |
| 20 | LFT0-83208 | 10 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| 21 | LFT1-83208 | 4 | 59660 | 4205-022-S | FEED-THRU FILTER 15A |
| 22 | JRAB-18200 | 3 | 98291 | 50-675-0000-31 | SMA F BULK MT CONN |
| 23 | 420CA08401 | 1 | 58900 | 420CA08401 | 40GHz ASY M7XXX |
| 24 | 420BF38100 | 1 | 58900 | 420BF38100 | 8-20 MTG BRACKET A;M7XXX |
| 25 | MPXX-00001 | 1 | 28480 | 11764D | HP ATTEN RIBBON CABLE |
| 26 | 120BF07600 | 1 | 58900 | 120BF07600 | O/P SWITCH MOUNT |
| 27 | 420CF22900 | 1 | 58900 | 420CF22900 | 2-8 MODULE MOUNT M7XXX |
| 28 | 120BF07700 | 1 | 58900 | 120BF07700 | REF SWITCH MOUNT |
| 29 | 420CF08900 | 1 | 58900 | 420CF08900 | 40 GHZ ATTEN MT; M7XXX |
| 31 | 420AW08400 | Ref | 58900 | 420AW08400 | 40 GHZ ASY W/L; M7XXX |
| 32 | JRAC-00101 | 1 | 16733 | 705979-001 | SMA M/F SWEPT RT ANGLE |
| 34 | 120BF14500 | 1 | 58900 | 120BF14500 | REF. COUPLER MOUNT |
| 35 | 120BF14600 | 1 | 58900 | 120BF14600 | MIXER MOUNT |
| 41 | JRAA-00201 | 2 | 16179 | 20875005-00 | SMA M-M SWEPT RT ANGLE |
| 42 | JRAA-00200 | 4 | 98291 | 50-673-0159-31 | SMA M TO SMA M ADAPT |
| 44 | 120CF12400 | 1 | 58900 | 120CF12400 | DOWNCONVERTER MOUNT |
| 45 | DPAB-05391 | 3 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| 46 | RN55-00150 | 3 | 81349 | RN55C15R0F | 15 OHMS 1% MET FILM |
| 47 | LAD0-07100 | 1 | 72259 | WEE-100 | 100 UH INDUCTOR |
| 48 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| 49 | 120CA15222 | 1 | 58900 | 120CA15222 | S/R .085 CABLE #V 7XXX A |
| 50 | 120CA15224 | 1 | 58900 | 120CA15224 | S/R .085 CABLE #X ASY |
| 51 | 120CA15205 | 1 | 58900 | 120CA15205 | .085 CABLE #E ASY |
| 52 | WCAS-18006 | 1 | 64023 | 1-3636-600-5206 | 6' 26 GHz SEMI-FLEX COAX |
| 53 | 120CA15226 | 1 | 58900 | 120CA15226 | .085 CABLE #Z ASY |
| 55 | 120CA15306 | 2 | 58900 | 120CA15306 | .141 CABLE #6 ASY |
| 56 | WCAS-18004 | 1 | 64023 | 1-3636-600-5204 | 4' 26 GHz SEMI-FLEX COAX |
| 57 | 120CA15340 | 1 | 58900 | 120CA15340 | S/R .141 CABLE #40 ASY |
| 58 | MDS0-00002 | 1 | 62331 | 301E | .01-20GHz SMA DETECTOR |
| 66 | 120CA15211 | 1 | 58900 | 120CA15211 | .085 CABLE #K ASY |
| 67 | 120CA15223 | 1 | 58900 | 120CA15223 | S/R .085 CABLE #W ASY |
| 68 | 120CA15216 | 1 | 58900 | 120CA15216 | .085 CABLE #P |
| 70 | 120CA15218 | 1 | 58900 | 120CA15218 | .085 M/RT ANGLE #R |
| 71 | 120CA18302 | 1 | 58900 | 120CA18302 | .118 CABLE #2 ASY |
| 72 | 120CA18304 | 1 | 58900 | 120CA18304 | .118 CABLE #4 ASY |
| 73 | 120CA18301 | 2 | 58900 | 120CA18301 | .118 CABLE #1 ASY |
| 74 | 120CA18305 | 1 | 58900 | 120CA18305 | .118 CABLE #5 ASY |
| 75 | WCAS-18005 | 1 | 64023 | 1-3636-600-5205 | 5' 26 GHz SEMI-FLEX COAX |

### Parts List for 120DA00651 .01-40 GHz FREQ ASY Rev A

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 76 | WCAS-18003 | 1 | 64023 | 1-3636-600-5203 | 3' 26 GHz SEMI-FLEX COAX |
| 79 | 420BA20410 | 1 | 58900 | 420BA20410 | 40 GHz DRVR HARNESS |
| 80 | 420AW20410 | Ref | 58900 | 420AW20410 | 40 GHz DRVR HARNESS W/L |
| 103 | HBPP-25605 | 2 | 96906 | MS-51957-4 | 2-56 X 5/16 PAN |
| 104 | HBFP-44003 | 3 | 96906 | MS-24693-01 | 4-40 X 3/16 FLAT |
| 105 | HBFP-44004 | 4 | 96906 | MS-24693-02 | 4-40 X 1/4 FLAT |
| 106 | HBPP-44004 | 12 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |
| 107 | HBFP-44005 | 4 | 96906 | MS-24693-03 | 4-40 X 5/16 FLAT |
| 108 | HBPP-44005 | 6 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 110 | HBPP-63204 | 22 | 96906 | MS-51957-26 | 6-32 X 1/4 PAN |
| 112 | HBPP-63205 | 4 | 96906 | MS-51957-27 | 6-32 X 5/16 PAN |
| 113 | HBFP-63205 | 2 | 96906 | MS-24693-25 | 6-32 X 5/16 FLAT |
| 114 | HWFS-20400 | 2 | 96906 | MS15795-802 | #2 X 1/4 FLAT WASHER |
| 116 | HWFS-40500 | 5 | 96906 | MS15795-804 | #4 X 5/16 FLAT WASHER |
| 117 | HWFS-60500 | 8 | 96906 | MS15795-805 | #6 X 5/16 FLAT WASHER |
| 118 | HWSS-20200 | 2 | 96906 | MS35338-134 | #2 X 1/8 SPLIT LOCK |
| 119 | HWSS-40300 | 26 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 120 | HWSS-60400 | 24 | 96906 | MS35338-136 | #6 X 1/4 SPLIT LOCK |
| 122 | HLLT-80212 | 4 | 79963 | 505-#8 | #8 SOLDER LUG |
| 123 | HNKS-44004 | 1 | 96906 | MS35649-*** | 4-40 KEP NUT |
| 124 | HNKS-63204 | 4 | 96906 | MS35649-*** | 6-32 KEP NUT |
| 125 | HMPP-03010 | 2 | 96906 | M3X10-PP-SS | 3mm X 10mm PAN HEAD |
| 126 | HBPP-44012 | 3 | 96906 | MS-51957-19 | 4-40 X 3/4 PAN |
| 127 | HBPP-44018 | 3 | 96906 | MS-51957-121 | 4-40 X 1 1/8 PAN |
| 128 | HNSS-44004 | 1 | 96906 | MS35649-244 | 4-40 HEX NUT |
| A 8 | 120BA09211 | -1 | 58900 | 120BA09211 | ANALOG SWEEP 1 PCA |
| A 8 | 120BA09212 | 1 | 58900 | 120BA09212 | ANALOG SWEEP 1 PCA -40GH |
| A 9 | 120BA09100 | -1 | 58900 | 120BA09100 | DIGITAL RAMP PCA |
| A 9 | 120BA09101 | 1 | 58900 | 120BA09101 | DIGITAL RAMP PCA |
| A 200 | 120BA07900 | 1 | 58900 | 120BA07900 | DETECTOR BUFFER PCA |
| A 201 | 120CA11500 | 1 | 58900 | 120CA11500 | 100MHz MODULE ASY |
| A 202 | 004CA09103 | 1 | 58900 | 004CA09103 | DWN CONV/W CNTR M7XXX AS |
| A 204 | 004BA16700 | 1 | 58900 | 004BA16700 | .01-2 MIXER/AMP M7X00 |
| R 1 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 2 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 3 | RW25-00050 | 1 | 15915 | TM25-5 OHM-1%Y | 5 OHM 25W KELVIN LEAD |

**Parts List for 120DA00641 2-40 GHz FREQ ASY Rev A**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 004BA31300 | 1 | 58900 | 004BA31300 | 8-20GHZ AMP/LVL/MODULATO |
| 2 | 004BA33820 | 1 | 58900 | 004BA33820 | .01-40 SWITCH/FILTER ASY |
| 3 | 004BA30800 | 1 | 58900 | 004BA30800 | 2-8 LEV/MOD/AMO ASSY |
| 4 | 004BA28700 | 1 | 58900 | 004BA28700 | REF COUPLER N M7XXX ASY |
| 5 | 004BA28800 | 1 | 58900 | 004BA28800 | REF SWITCH N M7XXX ASY |
| 6 | 120AW00603 | Ref | 58900 | 120AW00603 | 2-20 FREQUENCY ASSY W/L |
| 9 | MP90-04000 | 1 | 28480 | 33326L;OPT006 & 890 | 90dB 40GHZ 10dB STP ATTN |
| 10 | MCD0-00240 | 1 | 62331 | 202040013KE | 2-40 GHZ DIR DET/REF |
| 11 | JRAT-00000 | 9 | 95077 | 2998-6001 | SMA CAP |
| 12 | JRAT-00050 | 1 | 16179 | 2001-6113-00 | 50 OHM SMA TERMINATION |
| 13 | MMDC-00126 | 1 | 99899 | 80014 | 2-26 GHZ 500 MHZ IF MIX |
| 14 | MOYT-10820 | 1 | 24539 | Y091-2804 | 8-20 GHz YIG XSTR OSC |
| 15 | MOYT-00209 | 2 | 24539 | S080-1342 | 1.9-8.7 GHZ YIG XSTR OSC |
| 16 | 120DF08400 | 1 | 58900 | 120DF08400 | MICROWAVE CHASSIS |
| 17 | 420BF38800 | 1 | 58900 | 420BF38800 | SMA SPACER; M7XXX |
| 18 | 420BF22800 | 1 | 58900 | 420BF22800 | 2-8 MODULE HEATSINK'M7XX |
| 19 | 420BF38200 | 1 | 58900 | 420BF38200 | 8-20 MTG BRACKET B;M7XXX |
| 20 | LFT0-83208 | 10 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| 21 | LFT1-83208 | 4 | 59660 | 4205-022-S | FEED-THRU FILTER 15A |
| 22 | JRAB-18200 | 3 | 98291 | 50-675-0000-31 | SMA F BULK MT CONN |
| 23 | 420CA08401 | 1 | 58900 | 420CA08401 | 40GHz ASY M7XXX |
| 24 | 420BF38100 | 1 | 58900 | 420BF38100 | 8-20 MTG BRACKET A;M7XXX |
| 25 | MPXX-00001 | 1 | 28480 | 11764D | HP ATTEN RIBBON CABLE |
| 26 | 120BF07600 | 1 | 58900 | 120BF07600 | O/P SWITCH MOUNT |
| 27 | 420CF22900 | 1 | 58900 | 420CF22900 | 2-8 MODULE MOUNT M7XXX |
| 28 | 120BF07700 | 1 | 58900 | 120BF07700 | REF SWITCH MOUNT |
| 29 | 420CF08900 | 1 | 58900 | 420CF08900 | 40 GHZ ATTEN MT; M7XXX |
| 31 | 420AW08400 | Ref | 58900 | 420AW08400 | 40 GHZ ASY W/L; M7XXX |
| 34 | 120BF14500 | 1 | 58900 | 120BF14500 | REF. COUPLER MOUNT |
| 35 | 120BF14600 | 1 | 58900 | 120BF14600 | MIXER MOUNT |
| 41 | JRAA-00201 | 2 | 16179 | 20875005-00 | SMA M-M SWEPT RT ANGLE |
| 42 | JRAA-00200 | 4 | 98291 | 50-673-0159-31 | SMA M TO SMA M ADAPT |
| 43 | 101BA41700 | 1 | 58900 | 101BA41700 | 100MHz MOUNT ASY |
| 44 | 120CF12400 | 1 | 58900 | 120CF12400 | DOWNCONVERTER MOUNT |
| 45 | DPAB-05391 | 3 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| 46 | RN55-00150 | 3 | 81349 | RN55C15R0F | 15 OHMS 1% MET FILM |
| 47 | LAD0-07100 | 1 | 72259 | WEE-100 | 100 UH INDUCTOR |
| 48 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| 49 | 120CA15222 | 1 | 58900 | 120CA15222 | S/R .085 CABLE #V 7XXX A |
| 50 | 120CA15224 | 1 | 58900 | 120CA15224 | S/R .085 CABLE #X ASY |
| 51 | 120CA15205 | 1 | 58900 | 120CA15205 | .085 CABLE #E ASY |
| 52 | 120CA15334 | 1 | 58900 | 120CA15334 | S/R .141 CABLE #34 7XXX |
| 55 | 120CA15306 | 2 | 58900 | 120CA15306 | .141 CABLE #6 ASY |
| 56 | WCAS-18004 | 1 | 64023 | 1-3636-600-5204 | 4' 26 GHz SEMI-FLEX COAX |
| 57 | 120CA15340 | 1 | 58900 | 120CA15340 | S/R .141 CABLE #40 ASY |
| 71 | 120CA18302 | 1 | 58900 | 120CA18302 | .118 CABLE #2 ASY |
| 72 | 120CA18304 | 1 | 58900 | 120CA18304 | .118 CABLE #4 ASY |
| 73 | 120CA18301 | 2 | 58900 | 120CA18301 | .118 CABLE #1 ASY |
| 74 | 120CA18305 | 1 | 58900 | 120CA18305 | .118 CABLE #5 ASY |
| 75 | 120CA15328 | 1 | 58900 | 120CA15328 | .141 CABLE #28 TO 40GHZ |
| 76 | 120CA15329 | 1 | 58900 | 120CA15329 | .141 CABLE #29-40GHZ ASY |
| 79 | 420BA20410 | 1 | 58900 | 420BA20410 | 40 GHz DRVR HARNESS |
| 80 | 420AW20410 | Ref | 58900 | 420AW20410 | 40 GHz DRVR HARNESS W/L |
| 103 | HBPP-25605 | 4 | 96906 | MS-51957-4 | 2-56 X 5/16 PAN |
| 104 | HBFP-44003 | 3 | 96906 | MS-24693-01 | 4-40 X 3/16 FLAT |
| 106 | HBPP-44004 | 12 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |
| 107 | HBFP-44005 | 4 | 96906 | MS-24693-03 | 4-40 X 5/16 FLAT |

**Parts List for 120DA00641 2-40 GHz FREQ ASY Rev A**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 108 | HBPP-44005 | 6 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 110 | HBPP-63204 | 22 | 96906 | MS-51957-26 | 6-32 X 1/4 PAN |
| 112 | HBPP-63205 | 4 | 96906 | MS-51957-27 | 6-32 X 5/16 PAN |
| 113 | HBFP-63205 | 2 | 96906 | MS-24693-25 | 6-32 X 5/16 FLAT |
| 114 | HWFS-20400 | 2 | 96906 | MS15795-802 | #2 X 1/4 FLAT WASHER |
| 116 | HWFS-40500 | 5 | 96906 | MS15795-804 | #4 X 5/16 FLAT WASHER |
| 117 | HWFS-60500 | 8 | 96906 | MS15795-805 | #6 X 5/16 FLAT WASHER |
| 118 | HWSS-20200 | 4 | 96906 | MS35338-134 | #2 X 1/8 SPLIT LOCK |
| 119 | HWSS-40300 | 26 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 120 | HWSS-60400 | 24 | 96906 | MS35338-136 | #6 X 1/4 SPLIT LOCK |
| 122 | HLLT-80212 | 4 | 79963 | 505-#8 | #8 SOLDER LUG |
| 123 | HNKS-44004 | 1 | 96906 | MS35649-*** | 4-40 KEP NUT |
| 124 | HNKS-63204 | 4 | 96906 | MS35649-*** | 6-32 KEP NUT |
| 125 | HMPP-03010 | 2 | 96906 | M3X10-PP-SS | 3mm X 10mm PAN HEAD |
| 126 | HBPP-44012 | 3 | 96906 | MS-51957-19 | 4-40 X 3/4 PAN |
| 127 | HBPP-44018 | 3 | 96906 | MS-51957-121 | 4-40 X 1 1/8 PAN |
| 128 | HNSS-44004 | 1 | 96906 | MS35649-244 | 4-40 HEX NUT |
| A 8 | 120BA09211 | -1 | 58900 | 120BA09211 | ANALOG SWEEP 1 PCA |
| A 8 | 120BA09212 | 1 | 58900 | 120BA09212 | ANALOG SWEEP 1 PCA -40GH |
| A 9 | 120BA09100 | -1 | 58900 | 120BA09100 | DIGITAL RAMP PCA |
| A 9 | 120BA09101 | 1 | 58900 | 120BA09101 | DIGITAL RAMP PCA |
| A 200 | 120BA07900 | 1 | 58900 | 120BA07900 | DETECTOR BUFFER PCA |
| A 201 | 120CA11500 | 1 | 58900 | 120CA11500 | 100MHz MODULE ASY |
| R 1 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 2 | RW25-00070 | 1 | 15915 | TM25-7 OHM-1%Y | 7 OHM 25W KELVIN LEAD |
| R 3 | RW25-00050 | 1 | 15915 | TM25-5 OHM-1%Y | 5 OHM 25W KELVIN LEAD |

**Parts List for 004BA31300 8-20GHZ AMP/LVL/MODULATO Rev D**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005DA31300 | 1 | 58900 | 005DA31300 | 8-20GHZ AMP/LVL/MODULATO |
| 2 | 001BF01076 | 1 | 58900 | 001BF01076 | MODULE LABEL 004BA31300 |
| 3 | 004AT31300 | Ref | 58900 | 004AT31300 | 8-20GHZ AMP/LVL/MODULATO |
| 4 | LAD0-05470 | 1 | 72259 | WEE-4.7 | 4.7 UH INDUCTOR |
| 5 | CC50-01750 | 1 | 51642 | 200-100-NPO-751J | 750 PF CERAMIC NPO |
| 6 | CC50-01150 | 1 | 51642 | 150-100-COG-151J | 150 PF CERAMIC NPO |
| 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

**Parts List for 004BA28500 O/P SWITCH F ASY M7XXX Rev C**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005BA28500 | 1 | 58900 | 005BA28500 | O/P SWITCH F MWA M7XXX |
| 2 | 001BF01038 | 1 | 58900 | 001BF01038 | MODULE LABEL 004BA28500 |

**Parts List for 004BA30800 2-8 LEV/MOD/AMO ASSY Rev E**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005DA30800 | 1 | 58900 | 005DA30800 | 2-8 LEV/MOD/AMP ASY |
| 2 | 001BF01062 | 1 | 58900 | 001BF01062 | MODULE LABEL 004BA30800 |
| 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| 4 | LAD0-05470 | 1 | 72259 | WEE-4.7 | 4.7 UH INDUCTOR |
| 5 | CC50-01150 | 1 | 51642 | 150-100-COG-151J | 150 PF CERAMIC NPO |
| 6 | CC50-01750 | 1 | 51642 | 200-100-NPO-751J | 750 PF CERAMIC NPO |
| 7 | HLLT-40210 | 2 | 79963 | 505-#4 | #4 SOLDER LUG |
| 8 | WKC0-37500 | 2 | 92194 | FIT-221-3/8 | 3/8' SHRINK TUBE |
| 9 | WTT0-20000 | 3 | 29005 | #20 TFE TW | #20 CLEAR TFE SLVNG |
| 101 | HBPP-44004 | 2 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |

**Parts List for 004BA28700 REF COUPLER N M7XXX ASY Rev B**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005BA28700 | 1 | 58900 | 005BA28700 | REF COUPLER N M7XXX MWA |
| 2 | 001BF01040 | Ref | 58900 | 001BF01040 | MODULE LABEL 004BA28700 |

**Parts List for 004BA28800 REF SWITCH N M7XXX ASY Rev B**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005BA28800 | 1 | 58900 | 005BA28800 | REF SWITCH N M7XXX MWA |
| 2 | 001BF01041 | Ref | 58900 | 001BF01041 | MODULE LABEL 004BA28800 |
| 3 | HLLT-40210 | 3 | 79963 | 505-#4 | #4 SOLDER LUG |

**Parts List for 004BA00001 SAMPLER ASSEMBLY Rev C**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005CA00000 | 1 | 58900 | 005CA00000 | SAMPLER MODULE |
| 2 | 001BF01069 | 1 | 58900 | 001BF01069 | MODULE LABEL 004BA00001 |
| 3 | 004AT00000 | Ref | 58900 | 004AT00000 | TEST PROCEDURE SAMPLER |
| 4 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |

### Parts List for 004BA00101 SAMPLER ASSY REVERSE MTG Rev C

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005CA00100 | 1 | 58900 | 005CA00100 | SAMPLER MODULE; INVERTED |
| 2 | 001BF01070 | 1 | 58900 | 001BF01070 | MODULE LABEL 004BA00101 |
| 3 | 004AT00000 | Ref | 58900 | 004AT00000 | TEST PROCEDURE SAMPLER |
| 4 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |

### Parts List for 004CA09103 DWN CONV/W CNTR M7XXX AS Rev A

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 101BA05205 | 1 | 58900 | 101BA05205 | HIGH BND FLTRS M7XXX PCA |
| 2 | 101BA06001 | 1 | 58900 | 101BA06001 | LOW BAND FILTERS PCA |
| 3 | 101BF26000 | 1 | 58900 | 101BF26000 | END PLATE 100 MHZ MODULE |
| 4 | 101CF19901 | 1 | 58900 | 101CF19901 | DOWNCONVERTER BOTTOM COV |
| 5 | 101CF20000 | 1 | 58900 | 101CF20000 | DOWNCONVERTER TOP COVER |
| 6 | JRAF-00051 | 3 | 98291 | 50-645-4504-89 | SMA F BULK MT CONNECTOR |
| 7 | 001BF01084 | Ref | 58900 | 001BF01084 | MODULE LABEL 004CA09103 |
| 8 | 101CF19800 | 1 | 58900 | 101CF19800 | DOWNCONVERTER HOUSING |
| 9 | LFT0-83216 | 11 | 59660 | 4201-014-s | FEED-THRU FILTER 15A |
| 10 | GELS-26125 | Ref | 04552 | LS26-1/8 | LS26 ECCOSORB |
| 12 | 101BF26100 | 2 | 58900 | 101BF26100 | SIDE PLATE 100 MHZ MODUL |
| 14 | 120CF16300 | 1 | 58900 | 120CF16300 | DOWNCONVERTER WALL |
| 15 | HBHS-83202 | 1 | 96906 | MS-51963-33 | 8-32 X 1/8 SET SCREW |
| 101 | HBPP-25603 | 22 | 96906 | MS-51957-2 | 2-56 X 3/16 PAN |
| 102 | HBPP-25604 | 54 | 96906 | MS-51957-3 | 2-56 X 1/4 PAN |
| 103 | HBFP-25605 | 18 | 96906 | MS-24693-*** | 2-56 X 5/16 FLAT |
| 104 | HWSS-20200 | 74 | 96906 | MS35338-134 | #2 X 1/8 SPLIT LOCK |
| 105 | HBFP-25608 | 4 | 96906 |  | 2-56 X 1/2 FLAT |

### Parts List for 101BA05205 HIGH BND FLTRS M7XXX PCA Rev 2

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 101CF05202 | 1 | 58900 | 101CF05202 | HI BAND PCB W/O AMP |
| 2 | TDPC-03010 | 18 | 59365 | M5X2905 | CHIP PIN DIODE |
| 3 | TDPG-00200 | 4 | 1HJ31 | MA-4P404-54 | GLASS PACK PIN DIODE |
| 11 | CK50-03100 | 3 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| 12 | TLW0-01227 | 9 | 60450 | 50-1847-CAT | 227 NH INDUCTOR |
| 13 | LAD0-06270 | 2 | 72259 | WEE-27 | 27 UH INDUCTOR |
| 14 | RN55-05620 | 2 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |

### Parts List for 101BA06001 LOW BAND FILTERS PCA Rev 1

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 101CF06000 | 1 | 58900 | 101CF06000 | LOW BAND FILTERS PCB |
| 3 | RN55-04750 | 9 | 81349 | RN55C4750F | 475 OHMS 1% MET FILM |
| 4 | RN55-11000 | 4 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| 5 | CC50-00270 | 2 | 52763 | EDPT-27-NPO-5% | 27 PF CERAMIC NPO |
| 6 | CC50-00390 | 2 | 51642 | 150-100-COG-390J | 39 PF CERAMIC NPO |
| 9 | CC50-00560 | 2 | 51642 | 150-100-COG-560J | 56 PF CERAMIC NPO |

**Parts List for 120BA13500 COUPLER Rev B2**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120BF13500 | 1 | 58900 | 120BF13500 | COUPLER PCB |
| 2 | 120BF13200 | 1 | 58900 | 120BF13200 | COUPLER HOUSING |
| 3 | 120BF13300 | 1 | 58900 | 120BF13300 | COUPLER COVER |
| 4 | 120BF13400 | 1 | 58900 | 120BF13400 | COUPLER BOTTOM COVER |
| 5 | MC10-00002 | 1 | 15542 | PDC-10-5 | 1-2000 MHZ 10 DB CPLR |
| 6 | JRAF-00050 | 3 | 2J899 | 9412-1113-000 | SMA F BULK MT CONNECTOR |
| 7 | CK50-01220 | 1 | 31433 | VJ0805A221JXAMB | 220 PF NP0 CHIP |

**Parts List for 004BA16700 .01-2 MIXER/AMP M7X00 Rev C**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005BA16700 | 1 | 58900 | 005BA16700 | .01-2 MIXER/AMP M7X00 |
| 2 | 001BF01056 | Ref | 58900 | 001BF01056 | MODULE LABEL 004BA16700 |
| 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| 101 | HLLT-40210 | 1 | 79963 | 505-#4 | #4 SOLDER LUG |
| 102 | HBPP-44003 | 1 | 96906 | MS-51957-12 | 4-40 X 3/16 PAN |

**Parts List for 101BA41700 100MHz MOUNT ASY Rev A**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 101CF25700 | 1 | 58900 | 101CF25700 | 100 MHZ MODULE MOUNT |
| 2 | 101BF26000 | 1 | 58900 | 101BF26000 | END PLATE 100 MHZ MODULE |
| 3 | 101BF26100 | 2 | 58900 | 101BF26100 | SIDE PLATE 100 MHZ MODUL |

**Parts List for 004BA33100 AMP/LVL/;MOD ASY 20-26GH Rev D**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005CA33100 | 1 | 58900 | 005CA33100 | AMP/LVL/MOD MWA 20-26GHZ |
| 2 | 001BF01076 | 1 | 58900 | 001BF01076 | MODULE LABEL 004BA31300 |
| 3 | 004AT31300 | Ref | 58900 | 004AT31300 | 8-20GHZ AMP/LVL/MODULATO |
| 4 | LAD0-05470 | 1 | 72259 | WEE-4.7 | 4.7 UH INDUCTOR |
| 5 | CC50-01750 | 1 | 51642 | 200-100-NPO-751J | 750 PF CERAMIC NPO |
| 6 | CC50-01150 | 1 | 51642 | 150-100-COG-151J | 150 PF CERAMIC NPO |
| 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

**Parts List for 004BA33820 .01-40 SWITCH/FILTER ASY Rev 2**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005CA33820 | 1 | 58900 | 005CA33820 | .01-40 SWITCH/FILTER ASY |
| 2 | 001BF01096 | 1 | 58900 | 001BF01096 | MODULE LABEL 004BA33820 |

### Parts List for 420CA08401 40GHz ASY M7XXX Rev C

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 420BF08501 | 2 | 58900 | 420BF08501 | HEATSINK;M7XXX 40GHZ |
| 2 | 420BF08601 | 2 | 58900 | 420BF08601 | DBLR MT;M7XXX 40 GHZ |
| 3 | 420BF08700 | 2 | 58900 | 420BF08700 | B/P FILT MT; M7XXX 40 GH |
| 4 | 420CF08801 | 1 | 58900 | 420CF08801 | DBLR/FILTER/SW MT; M7XXX |
| 5 | 004BA30600 | 1 | 58900 | 004BA30600 | .01-40 GHZ OUTPUT SWITCH |
| 6 | MXA2-12028 | 1 | 1CY63 | S92-1955B | 20-28GHz +15DBM DOUBLER |
| 7 | MXA2-12840 | 1 | 1CY63 | S92-1956B | 28-40GHz +15DBM DOUBLER |
| 8 | MFB0-02028 | 1 | 1CY63 | SM41148 | 20-28 GHZ BAND PASS |
| 9 | MFB0-02840 | 1 | 1CY63 | SM41149 | 28-40 GHZ BAND PASS |
| 101 | HBFP-25603 | 8 | 96906 | MS-24693-*** | 2-56 X 3/16 FLAT |
| 102 | HBFP-25608 | 4 | 96906 |  | 2-56 X 1/2 FLAT |
| 103 | HBPP-44004 | 6 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |
| 104 | HBFP-44005 | 2 | 96906 | MS-24693-03 | 4-40 X 5/16 FLAT |
| 105 | HWFS-40400 | 2 | 96906 | MS15795-803 | #4 X 1/4 FLAT WASHER |
| 106 | HWFS-20300 | 4 | 96906 | 5710-133-30P | #2 X 3/16 FLAT WASHER |
| 107 | HNSS-25603 | 4 | 96906 | MS35649-224 | 2-56 HEX NUT |
| 108 | HWSS-40300 | 6 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 109 | HNKS-44004 | 10 | 96906 | MS35649-*** | 4-40 KEP NUT |
| 110 | HNSS-44003 | 4 | 96906 | MS35649-*** | 4-40 HEX NUT |
| A 108 | 420BA13610 | 1 | 58900 | 420BA13610 | 40GHz DRIVER PCA;M7XXX |

### Parts List for 004BA30600 .01-40 GHZ OUTPUT SWITCH Rev C

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005BA30600 | 1 | 58900 | 005BA30600 | .01-40 GHZ OUTPUT SWITCH |
| 2 | 001BF01059 | Ref | 58900 | 001BF01059 | MODULE LABEL 004BA30600 |

### Parts List for 004BA33820 .01-40 SWITCH/FILTER ASY Rev 2

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005CA33820 | 1 | 58900 | 005CA33820 | .01-40 SWITCH/FILTER ASY |
| 2 | 001BF01096 | 1 | 58900 | 001BF01096 | MODULE LABEL 004BA33820 |

### Parts List for 120DA11200 BENCH MOUNT DRESS ASY Rev D

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120DF04901 | 1 | 58900 | 120DF04901 | BEZEL PAINTED |
| 2 | 120CF04100 | 2 | 58900 | 120CF04100 | SIDE TRIM |
| 3 | 120CF04400 | 1 | 58900 | 120CF04400 | TOP COVER |
| 4 | 120DA04500 | 1 | 58900 | 120DA04500 | BOTTOM COVER ASY |
| 5 | 120BA11300 | 2 | 58900 | 120BA11300 | HANDLE ASY |
| 6 | 120AA14300 | 1 | 58900 | 120AA14300 | ACCESSORIES ASY |
| 7 | GFU0-00804 | 20 | 20999 | 03318 | ADH TAPE .5W X .25 THICK |
| 101 | HBFP-44003 | 20 | 96906 | MS-24693-01 | 4-40 X 3/16 FLAT |
| 102 | HBFP-83204 | 6 | 96906 | MS-24693-C46 | 8-32 X .250 FLAT HEAD |
| 103 | HBFP-83207 | 4 | 96906 | MS-24693-C49 | 8-32 X 7/16 FLAT |
| 104 | HBFP-63204 | 4 | 96906 | MS-24693-24 | 6-32 X 1/4 FLAT |
| 105 | HBFP-63205 | 2 | 96906 | MS-24693-25 | 6-32 X 5/16 FLAT |

### Parts List for 120DA04500 BOTTOM COVER ASY Rev A

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF04500 | 1 | 58900 | 120CF04500 | BOTTOM COVER |
| 2 | HFFR-63202 | 2 | 21604 | PP 40012-2 | RIGHT FRONT FOOT |
| 3 | HFFL-63202 | 2 | 21604 | PP 40012-1 | LEFT FRONT FOOT |
| 4 | HFBI-00012 | 1 | 21604 | MP-40008-4 | 12' INSIDE MOUNT BAIL |
| 5 | HNTU-63206 | 8 | 78553 | MP40366 | #6 TINNERMAN NUT |

### Parts List for 120BA11300 HANDLE ASY Rev B

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120BF11300 | 1 | 58900 | 120BF11300 | HANDLE |
| 2 | 120BF12800 | 1 | 58900 | 120BF12800 | HANDLE GRIP |

### Parts List for 003CA80203 M7XXX RACK MOUNT/SLIDES Rev E

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120DF04901 | 1 | 58900 | 120DF04901 | BEZEL PAINTED |
| 2 | 120AA14300 | 1 | 58900 | 120AA14300 | ACCESSORIES ASY |
| 3 | 120CF04400 | 1 | 58900 | 120CF04400 | TOP COVER |
| 4 | 120CF04500 | 1 | 58900 | 120CF04500 | BOTTOM COVER |
| 5 | 120BA11300 | 2 | 58900 | 120BA11300 | HANDLE ASY |
| 6 | 120BF12700 | 2 | 58900 | 120BF12700 | RACK MOUNT FLANGE |
| 7 | HRSA-20001 | 1 | 05236 | 1201723-L | 20' RACK SLIDE |
| 8 | HRSA-20002 | 1 | 05236 | 1201723-R | 20' RACK SLIDE |
| 10 | 420CF16200 | 2 | 58900 | 420CF16200 | SLIDE MTG SPACER M7XXX3 |
| 11 | 420BF16300 | 2 | 58900 | 420BF16300 | FRONT SLIDE MTG BKT |
| 12 | 420CF16400 | 2 | 58900 | 420CF16400 | REAR SLIDE MTG BKT |
| 13 | 420BF38600 | 2 | 58900 | 420BF38600 | DISPLAY WARNING LABEL |
| 101 | HBFP-44004 | 20 | 96906 | MS-24693-02 | 4-40 X 1/4 FLAT |
| 102 | HBFP-83207 | 4 | 96906 | MS-24693-C49 | 8-32 X 7/16 FLAT |
| 103 | HBFP-63205 | 2 | 96906 | MS-24693-25 | 6-32 X 5/16 FLAT |
| 104 | HBPP-A3206 | 6 | 96906 | MIL STD | 10-32 X 3/8 PAN |
| 105 | HBPP-83206 | 2 | 96906 | MS-51957-43 | 8-32 X 3/8 PAN |
| 106 | HBFP-63204 | 4 | 96906 | MS-24693-24 | 6-32 X 1/4 FLAT |

### Parts List for 003CA80303 M7XXX RACK MOUNT Rev D

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120DF04901 | 1 | 58900 | 120DF04901 | BEZEL PAINTED |
| 2 | 120AA14300 | 1 | 58900 | 120AA14300 | ACCESSORIES ASY |
| 3 | 120CF04400 | 1 | 58900 | 120CF04400 | TOP COVER |
| 4 | 120CF04500 | 1 | 58900 | 120CF04500 | BOTTOM COVER |
| 5 | 120BA11300 | 2 | 58900 | 120BA11300 | HANDLE ASY |
| 6 | 120BF12700 | 2 | 58900 | 120BF12700 | RACK MOUNT FLANGE |
| 7 | 420BF38600 | 2 | 58900 | 420BF38600 | DISPLAY WARNING LABEL |
| 101 | HBFP-44004 | 20 | 96906 | MS-24693-02 | 4-40 X 1/4 FLAT |
| 102 | HBFP-83209 | 4 | 96906 |  | 8-32 X 9/16 FLAT |
| 103 | HBFP-63205 | 2 | 96906 | MS-24693-25 | 6-32 X 5/16 FLAT |
| 104 | HBFP-63204 | 4 | 96906 | MS-24693-24 | 6-32 X 1/4 FLAT |

### Parts List for 120AA14300 ACCESSORIES ASY Rev A

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120BA04700 | 1 | 58900 | 120BA04700 | COMPUTER EXTENDER BD PCA |
| 2 | 120BA09500 | 1 | 58900 | 120BA09500 | I/O EXTENDER BD PCA |
| 3 | 101BF21600 | 1 | 58900 | 101BF21600 | PC BOARD PULLER |
| 4 | WMP0-03006 | 1 | 16428 | 17506 | RT ANG IEC POWER CORD |
| 5 | 101BF21400 | Ref | 58900 | 101BF21400 | CHASSIS NOMENCLATURE LBL |
| 6 | 001BF01100 | Ref | 58900 | 001BF01100 | FOIL CAL |

### Parts List for 003CA80100 A001 CABLE KIT Rev A

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | JRAB-26200 | 1 | 93459 | 1587 | SMA F-SMA F 26G ADAPTER |
| 2 | JRAC-26200 | 1 | 93459 | 1588 | SMA M-SMA F 26G ADAPTER |
| 3 | WCA0-26015 | 1 | 17217 | P7101101018.0 | 18' 26GHZ COAX ASSY |
| 4 | WCA0-26060 | 1 | 17217 | P7101101072.0 | 72' 26GHZ COAX ASSY |

### Parts List for 003CA01101 OPTION 11, 5 MHZ EXT TB Rev B

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 2 | 105AW02502 | Ref | 58900 | 105AW02502 | M7X00 OPTION 11 W/L |
| 3 | 105AT02502 | Ref | 58900 | 105AT02502 | M7XXX OPT 11 TEST PROCED |
| 4 | 105AI02502 | Ref | 58900 | 105AI02502 | M7XXX OPT 11 ASY INSTRUC |
| 101 | HBFP-44004 | 3 | 96906 | MS-24693-02 | 4-40 X 1/4 FLAT |
| A 115 | 105BA02502 | 1 | 58900 | 105BA02502 | 5 MHZ EXT CLOCK PCA |

### Parts List for 003CA01603 OPT 16 1 HZ RESOLUTION Rev A1

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 2 | 120AW08800 | Ref | 58900 | 120AW08800 | 1 HZ PLL W/L |
| 3 | 101BA48006 | 1 | 58900 | 101BA48006 | 196;2 SMB-F RA; 6' |
| A 15 | 120BA08800 | 1 | 58900 | 120BA08800 | 1 Hz PLL PCA |

### Parts List for 003CA01702 17,FAST SCAN,20GHZ M7XXX Rev A1

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 003AW01702 | Ref | 58900 | 003AW01702 | 17,FAST SCAN,20GHZ M7XXX |
| 2 | 004BA10000 | 1 | 58900 | 004BA10000 | SCAN MODULE (M168) |
| 3 | MRTL-22018 | 1 | 28480 | 33313B | COAX TRANS. SWITCH |
| 4 | 120BF17600 | 1 | 58900 | 120BF17600 | SCAN MODULATION BRACKET |
| 5 | 120CA15315 | 1 | 58900 | 120CA15315 | .141 CABLE #15 ASY |
| 6 | 120CA15316 | 1 | 58900 | 120CA15316 | .141 CABLE #16 ASY |
| 7 | 120CA15317 | 1 | 58900 | 120CA15317 | .141 CABLE #17 ASY |
| 8 | 120CA15318 | 1 | 58900 | 120CA15318 | .141 CABLE #18 ASY |
| 9 | 120CA15319 | 1 | 58900 | 120CA15319 | .141 CABLE #19 ASY |
| 10 | 120BF18100 | Ref | 58900 | 120BF18100 | SCAN IN LABEL |
| A 7 | 120BA15600 | 1 | 58900 | 120BA15600 | SCAN MODULATION PCA |
| A3-U13 | UMN0-27256 | 1 | 14936 | AT27C256 | AT27C256 PROM ERASABLE |
| A3-U14 | UMN0-27256 | 1 | 14936 | AT27C256 | AT27C256 PROM ERASABLE |

### Parts List for 004BA10000 SCAN MODULE (M168) Rev B

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 005BA10000 | 1 | 58900 | 005BA10000 | SCAN MODULE (M168) |
| 2 | 001BF01019 | Ref | 58900 | 001BF01019 | MODULE LABEL 004BA10000 |

### Parts List for 003CA02204 OPTION 22,R/P RF OUT M7X Rev B

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CA15314 | 1 | 58900 | 120CA15314 | .141 CABLE #14 ASY |
| 2 | JRAB-00200 | 1 | 93459 | 9934-3 | SMA F BULK MT CONN |
| 3 | HPM0-00375 | 1 | 83330 | 652 | 3/8' HOLE PLUG |
| 4 | 107BF01700 | -1 | 58900 | 107BF01700 | SMA CONNECTOR MOUNT FLAN |
| 5 | 107BF01701 | -1 | 58900 | 107BF01701 | SMA CONNECTOR MOUNT SPAC |

### Parts List for 003BA02300 RF CONN N-TYPE F PNL ASY Rev A2

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | JRXA-00200 | 1 | 95077 | 1132-6001 | N TO SMA ADAPTER |

### Parts List for 003CA02400 OPTION 24,INT MODULATION Rev B

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| A5 A1 | 120BA12501 | 1 | 58900 | 120BA12501 | PULSE GENERATOR PCA |
| A6 A1 | 120BA12601 | 1 | 58900 | 120BA12601 | FUNCTION GENERATOR PCA |

### Parts List for 003BA02500 OPTION 25, PLANAR CROWN Rev A

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | JRWF-00010 | 1 | 93459 | 7004A-1 | 2.9MM F BULKHEAD CROWN |
| 2 | 420BF37900 | 1 | 58900 | 420BF37900 | PLATE;MTG;CONN;PLANAR CR |
| 101 | HNKS-44004 | 4 | 96906 | MS35649-*** | 4-40 KEP NUT |
| 102 | HWIS-K0801 | 1 | 96906 | MS35333-134 | 3/8 INCH LOCK WASHER |
| 103 | HWFS-K0901 | 2 | 55566 | 5710-320-60 | 3/8 INCH FLAT WASHER |

### Parts List for 120BA01300 FRONT PANEL I/F PCA Rev C (A1)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF01300 | 1 | 58900 | 120CF01300 | FRONT PANEL I/F PCB |
| 2 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| 3 | JSP0-10028 | 2 | 09922 | DILB28P-108 | 28 PIN DIP SOCKET |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 13 | CC50-00100 | 1 | 51642 | 100-100-COG-100J | 10 PF CERAMIC NPO |
| C 14 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 15 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 16 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| R 1 | RN55-23320 | 1 | 81349 | RN55C3322F | 33.2 K OHMS 1% MET FILM |
| R 2 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 3 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 4 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 5 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 6 | WJIB-05022 | 1 | 53387 | 923345-05 | .5' INSULATED JUMPER |
| R 7 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 8 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 9 | RN55-????? | Ref | 81349 | RN55C????F | SELECTED IN TEST |
| U 1 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 2 | UTN0-00202 | 1 | 01295 | 74HC20 | 74HC20 DUAL 4 IN NAND |
| U 3 | UGN0-01871 | 1 | 02735 | CDP 1871 ACE | 40 PIN;88 KEYS ENCODER |
| U 4 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 5 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 6 | UTN0-00742 | 1 | 18714 | 74HC74E | DUAL D FLIP-FLOPS |
| U 7 | UTN0-01232 | 1 | 01295 | SN74HC123 | RETRIG. MULTIVIBRATOR |
| U 8 | UTN0-00742 | 1 | 18714 | 74HC74E | DUAL D FLIP-FLOPS |
| U 9 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 10 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 11 | UTN0-00091 | 1 | 01295 | SN74LS09N | 74LS09 QUAD AND GATES |
| U 12 | UMN0-27256 | 1 | 14936 | AT27C256 | AT27C256 PROM ERASABLE |
| U 13 | UMN1-01230 | 1 | 0B0A9 | DS1230AB-150 | DS1230AB-150 NON-VOL RAM |
| U 14 | UTN0-00322 | 1 | 18714 | 74HC32E | QUAD 2 INPUT OR GATE |
| U 15 | UTN0-01322 | 1 | 01295 | SN74HC132N | SN74HC132N 4X SCHMIDT NA |

**Parts List for 120BA05300 IEEE / TIMER PCA Rev B (A2)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF05300 | 1 | 58900 | 120CF05300 | IEEE / TIMER PCB |
| 2 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| C 1 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-00270 | 1 | 52763 | EDPT-27-NPO-5% | 27 PF CERAMIC NPO |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-00270 | 1 | 52763 | EDPT-27-NPO-5% | 27 PF CERAMIC NPO |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 16 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| P 1 | JIA1-20010 | 1 | 09922 | 65805-11-10 | 10 PIN DUAL STRPLN PLUG |
| R 1 | RN55-15620 | 1 | 81349 | RN55C5621F | 5.62 K OHMS 1% MET FILM |
| R 2 | RN55-15620 | 1 | 81349 | RN55C5621F | 5.62 K OHMS 1% MET FILM |
| R 3 | RN55-15620 | 1 | 81349 | RN55C5621F | 5.62 K OHMS 1% MET FILM |
| R 4 | RN55-15620 | 1 | 81349 | RN55C5621F | 5.62 K OHMS 1% MET FILM |
| R 5 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 6 | WJIB-05022 | 1 | 53387 | 923345-05 | .5' INSULATED JUMPER |
| R 7 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 8 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 9 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 10 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 11 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 12 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 13 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 14 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 15 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| U 1 | UTN0-00022 | 1 | 18714 | 74HC02E | QUAD 2 INPUT NOR GATE |
| U 2 | UTN0-00091 | 1 | 01295 | SN74LS09N | 74LS09 QUAD AND GATES |
| U 3 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 4 | UIN0-01413 | 1 | 04713 | MC1413P | MC1413P X7 DRIVER .5A |
| U 5 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 6 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 7 | UIN0-01413 | 1 | 04713 | MC1413P | MC1413P X7 DRIVER .5A |
| U 8 | UIN2-01488 | 1 | 27014 | DS14C88N | QUAD LINE DRIVER;RS232C |
| U 9 | UIN2-01489 | 1 | 27014 | DS14C89AN | QUAD LINE RECVR;RS232 |
| U 10 | UGN0-68901 | 1 | 04713 | MC68901FN | GPIO / TIMER |
| U 11 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 12 | UGN1-09914 | 1 | 52840 | WD9914PL00 | WD9914PL00 IEEE-488 |
| U 13 | UIN0-75160 | 1 | 01295 | SN75160N | SN75160N IEEE BUFFER |
| U 14 | UIN0-75162 | 1 | 01295 | SN75162N | SN75162N IEEE BUFFER |
| XU 10 | JSG0-10052 | 1 | 70364 | LCS-52-02 | 52 PIN CHIP CARRIER |
| Y 1 | Y180-00246 | 1 | 00815 | C1360N | 2.4576MHz CRYSTAL |

**Parts List for 120BA01200 MEMORY PCA Rev C (A3)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS01200 | Ref | 58900 | 120BS01200 | MEMORY SCH |
| 1 | 120CF01200 | 1 | 58900 | 120CF01200 | MEMORY PCB |
| 2 | JSP0-10028 | 14 | 09922 | DILB28P-108 | 28 PIN DIP SOCKET |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| U 1 | UMN0-60256 | 1 | 58900 | UMN0-60256 | MCM60L256 CMOS RAM |
| U 2 | UMN0-60256 | 1 | 58900 | UMN0-60256 | MCM60L256 CMOS RAM |
| U 3 | UMN0-60256 | 1 | 58900 | UMN0-60256 | MCM60L256 CMOS RAM |
| U 4 | UMN0-60256 | 1 | 58900 | UMN0-60256 | MCM60L256 CMOS RAM |
| U 7 | UMN0-27256 | Ref | 14936 | AT27C256 | AT27C256 PROM ERASABLE |
| U 8 | UMN0-27256 | Ref | 14936 | AT27C256 | AT27C256 PROM ERASABLE |
| U 9 | UMN0-27256 | Ref | 14936 | AT27C256 | AT27C256 PROM ERASABLE |
| U 10 | UMN0-27256 | Ref | 14936 | AT27C256 | AT27C256 PROM ERASABLE |
| U 11 | UMN0-27256 | Ref | 14936 | AT27C256 | AT27C256 PROM ERASABLE |
| U 12 | UMN0-27256 | Ref | 14936 | AT27C256 | AT27C256 PROM ERASABLE |

## Parts List for 120BA01100 CPU PCA Rev C (A4)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF01100 | 1 | 58900 | 120CF01100 | CPU PCB |
| 2 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| C 1 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 2 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 3 | CC50-01150 | 1 | 51642 | 150-100-COG-151J | 150 PF CERAMIC NPO |
| C 4 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 24 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 27 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 28 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| Q 1 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| R 1 | RN55-22000 | 1 | 81349 | RN55C2002F | 20 K OHMS 1% MET FILM |
| R 2 | RN55-21500 | 1 | 81349 | RN55C1502F | 15 K OHMS 1% MET FILM |
| R 3 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 4 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 5 | RN55-04750 | 1 | 81349 | RN55C4750F | 475 OHMS 1% MET FILM |
| R 6 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 7 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 8 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 9 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 10 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 11 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 12 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 13 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 14 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 15 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 16 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| RM 1 | RM5S-14700 | 1 | 71450 | 750-61-R4.7K | 5 X 4.7K SIP RESISTOR NE |
| S 1 | SPP0-00101 | 1 | 09353 | TP11-H8ABE | SPST PC MT PUSHBUTTON |
| U 1 | UGZB-68000 | 1 | 04713 | MC68000FN8 | MICRPROCESSOR 8MHz |
| U 2 | UTN0-02452 | 1 | 18714 | 74HC245E | 74HC245E OCTAL BUS XCVR |
| U 3 | UTN0-02452 | 1 | 18714 | 74HC245E | 74HC245E OCTAL BUS XCVR |
| U 4 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 5 | UTN0-01230 | 1 | 01295 | SN74123N | SN74123N DUAL ONE SHOT |
| U 6 | UTN0-00042 | 1 | 01295 | SN74HC04 | SN74HC04 HEX INVERTER |
| U 7 | UTN0-01481 | 1 | 04713 | MC74LS148 | PRIORITY ENCODER |
| U 8 | UTN0-00202 | 1 | 01295 | 74HC20 | 74HC20 DUAL 4 IN NAND |

**Parts List for 120BA01100 CPU PCA Rev C (A4)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| U 9 | UTN0-00002 | 1 | 18714 | 74HC00E | 74HC00;QUAD 2IN NAND GTE |
| U 10 | UTN0-00091 | 1 | 01295 | SN74LS09N | 74LS09 QUAD AND GATES |
| U 11 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 12 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 13 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 14 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 15 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 16 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 17 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 18 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 19 | UTN0-00022 | 1 | 18714 | 74HC02E | QUAD 2 INPUT NOR GATE |
| U 20 | UTN0-00002 | 1 | 18714 | 74HC00E | 74HC00;QUAD 2IN NAND GTE |
| U 21 | UTN0-00322 | 1 | 18714 | 74HC32E | QUAD 2 INPUT OR GATE |
| XU 1 | JSG0-11068 | 1 | 71468 | LCS-68-02 | 68 PIN PLCC SOCKET |
| Y 1 | Y180-00800 | 1 | 63468 | ED080 | 8.00MHZ FUND XTAL |

**Parts List for 120BA09302 PULSE DRIVER PCA Rev B (A5)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS09302 | Ref | 58900 | 120BS09302 | PULSE DRIVER SCH |
| 1 | 120CF09302 | 1 | 58900 | 120CF09302 | PULSE DRIVER PCB |
| 2 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 7 | CC50-01120 | 1 | 51642 | 150-100-COG-121 | 120 PF CERAMIC NPO |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-01470 | 1 | 51642 | 150-100-COG-471 | 470 PF CERAMIC NPO |
| C 17 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 18 | CC50-00470 | 1 | 52763 | EDPT-47-NPO-5% | 47 PF CERAMIC NPO |
| C 19 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 20 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 24 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 27 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 28 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 29 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 30 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 31 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 32 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 35 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 37 | CC50-01510 | 1 | 51642 | 200-100-NPO-511J | 510 PF CERAMIC NPO |
| C 38 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 39 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 40 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 43 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 44 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 45 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 46 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 47 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 48 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 55 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| CR 1 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 2 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 4 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 5 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CX 12 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| CX 13 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| CX 14 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| CX 16 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| J 3 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| J 4 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| J 5 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| Q 7 | QBPS-05771 | 1 | 27014 | 2N5771 | 2N5771 15V 850MHZ PNP |
| Q 8 | QBNS-04275 | 1 | 27014 | PN4275 | PN4275 .1A 15V .6W NPN |
| R 1 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |

**Parts List for 120BA09302 PULSE DRIVER PCA Rev B (A5)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 2 | RN55-11210 | 1 | 81349 | RN55C1211F | 1.21 K OHMS 1% MET FILM |
| R 8 | RN55-00562 | 1 | 81349 | RN55C56R2F | 56.2 OHMS 1% MET FILM |
| R 14 | RN55-00562 | 1 | 81349 | RN55C56R2F | 56.2 OHMS 1% MET FILM |
| R 20 | RN55-00562 | 1 | 81349 | RN55C56R2F | 56.2 OHMS 1% MET FILM |
| R 21 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 22 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 23 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 24 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 25 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 27 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 28 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 29 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 30 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 31 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 32 | WJIB-05022 | 1 | 53387 | 923345-05 | .5' INSULATED JUMPER |
| R 34 | RN55-06810 | 1 | 81349 | RN55C6810F | 681 OHMS 1% MET FILM |
| R 35 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 36 | RN55-00511 | 1 | 81349 | RN55C51R1F | 51.1 OHMS 1% MET FILM |
| R 37 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 40 | RN55-03920 | 1 | 81349 | RN55C3920F | 392 OHMS 1% MET FILM |
| R 41 | RN55-11500 | 1 | 81349 | RN55C1501F | 1.5 K OHMS 1% MET FILM |
| R 42 | RAPD-11000 | 1 | 73138 | 89PR1K | 1K POT 15T PC MNT |
| R 43 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 44 | RAPD-11000 | 1 | 73138 | 89PR1K | 1K POT 15T PC MNT |
| R 45 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 53 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 54 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| RM 1 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| RM 2 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| RM 3 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| RX 26 | RN55-????? | Ref | 81349 | RN55C????F | SELECTED IN TEST |
| RX 52 | RN55-????? | Ref | 81349 | RN55C????F | SELECTED IN TEST |
| U 1 | UEN0-10124 | 1 | 04713 | MC10124P | MC10124P QUAD TTL TO ECL |
| U 2 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 3 | UEN0-10124 | 1 | 04713 | MC10124P | MC10124P QUAD TTL TO ECL |
| U 4 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 5 | UEN0-10105 | 1 | 04713 | MC10105P | MC10105P TRIPLE OR/NOR |
| U 6 | UEN0-10125 | 1 | 04713 | MC10125P | MC10125P QUAD ECL TO TTL |
| U 7 | ULN0-02901 | 1 | 27014 | LM2901N | LM2901N QUAD COMPARATOR |
| U 8 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 9 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 10 | UEN0-10125 | 1 | 04713 | MC10125P | MC10125P QUAD ECL TO TTL |
| U 11 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 12 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 13 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 14 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 15 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 16 | UID0-61072 | 1 | 17540 | A61072P | QUAD SWITCH DRIVER |
| U 18 | URG0-00337 | 1 | 04713 | LM337H | -1.2 TO -37V REGULATOR |
| U 20 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| VR 1 | DZAD-04732 | 1 | 04713 | 1N4732A | IN4732A 4.7 V ZENER |
| VR 2 | DZAD-04734 | 1 | 04713 | 1N4734A | IN4734 6.2V ZENER |

**Parts List for 120BA12501 PULSE GENERATOR PCA Rev B (A5A1)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS12501 | Ref | 58900 | 120BS12501 | PULSE GENERATOR SCH |
| 1 | 120CF12500 | 1 | 58900 | 120CF12500 | PULSE GENERATOR PCB |
| 2 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| 3 | HSTS-44005 | 3 | 55566 | 3048-B-440-A-0 | 5/16 ROUND SWAGE SPACER |
| 4 | WSTD-24900 | 1 | 29005 | EXE2419/36 24GA | 24 GA WHITE TFE WIRE |
| C 1 | CC50-00470 | 1 | 52763 | EDPT-47-NPO-5% | 47 PF CERAMIC NPO |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 8 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 12 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 13 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 14 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 21 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 24 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 28 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 29 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 30 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 31 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 32 | CV00-00730 | 1 | 72982 | DV6P530A | 7-30 PF VARIABLE |
| C 33 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 34 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 35 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 36 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 37 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 38 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 40 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 45 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 46 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 47 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 48 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 49 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 50 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 51 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 53 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 54 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 56 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 57 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 58 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 59 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 60 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 61 | CC50-00470 | 1 | 52763 | EDPT-47-NPO-5% | 47 PF CERAMIC NPO |

### Parts List for 120BA12501 PULSE GENERATOR PCA Rev B (A5A1)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 62 | CC50-00470 | 1 | 52763 | EDPT-47-NPO-5% | 47 PF CERAMIC NPO |
| CR 1 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| P 3 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| P 4 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| P 5 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| R 1 | RN55-14320 | 1 | 81349 | RN55C4321F | 4.32 K OHMS 1% MET FILM |
| R 2 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 3 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 4 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 5 | RN55-11500 | 1 | 81349 | RN55C1501F | 1.5 K OHMS 1% MET FILM |
| R 6 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 7 | RN55-15620 | 1 | 81349 | RN55C5621F | 5.62 K OHMS 1% MET FILM |
| R 8 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 9 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 10 | RN55-02210 | 1 | 81349 | RN55C2210F | 221 OHMS 1% MET FILM |
| R 11 | RN55-02210 | 1 | 81349 | RN55C2210F | 221 OHMS 1% MET FILM |
| R 12 | RN55-02210 | 1 | 81349 | RN55C2210F | 221 OHMS 1% MET FILM |
| R 13 | RN55-02210 | 1 | 81349 | RN55C2210F | 221 OHMS 1% MET FILM |
| R 15 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 16 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 17 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 18 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 19 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 20 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 21 | RN55-01300 | 1 | 81349 | RN55C1300F | 130 OHMS 1% MET FILM |
| R 22 | RN55-00825 | 1 | 81349 | RN55C82R5F | 82.5 OHMS 1% MET FILM |
| R 23 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 24 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 26 | RN55-03920 | 1 | 81349 | RN55C3920F | 392 OHMS 1% MET FILM |
| RM 1 | RM7S-03900 | 1 | 71450 | 750-81-R390 | 390 OHM X 7 SIP NETWRK |
| RM 2 | RM7S-03900 | 1 | 71450 | 750-81-R390 | 390 OHM X 7 SIP NETWRK |
| RM 3 | RM7S-03900 | 1 | 71450 | 750-81-R390 | 390 OHM X 7 SIP NETWRK |
| RM 4 | RM7S-03900 | 1 | 71450 | 750-81-R390 | 390 OHM X 7 SIP NETWRK |
| RM 5 | RM7S-03900 | 1 | 71450 | 750-81-R390 | 390 OHM X 7 SIP NETWRK |
| RM 6 | RM7S-03900 | 1 | 71450 | 750-81-R390 | 390 OHM X 7 SIP NETWRK |
| U 1 | UTN0-06241 | 1 | 01295 | 74LS624N | 74LS624N 20MHZ VCO |
| U 2 | UTN0-00002 | 1 | 18714 | 74HC00E | 74HC00;QUAD 2IN NAND GTE |
| U 3 | UCN0-51460 | 1 | 04713 | MC145146P | MC145146P FREQ SYNTH |
| U 4 | UCN0-51460 | 1 | 04713 | MC145146P | MC145146P FREQ SYNTH |
| U 5 | UEN0-10124 | 1 | 04713 | MC10124P | MC10124P QUAD TTL TO ECL |
| U 6 | UEN1-10131 | 1 | 04713 | MC10H131P | MC10H131P DUAL D F/F |
| U 7 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 8 | UEN1-10102 | 1 | 04713 | MC10H102pc | 10H102;QUAD NOR GATES |
| U 9 | UEN0-10124 | 1 | 04713 | MC10124P | MC10124P QUAD TTL TO ECL |
| U 10 | UEN1-10136 | 1 | 04713 | MC10H136P | MC10H136P 250MHZ DIV 16 |
| U 11 | UEN1-10136 | 1 | 04713 | MC10H136P | MC10H136P 250MHZ DIV 16 |
| U 12 | UEN1-10102 | 1 | 04713 | MC10H102pc | 10H102;QUAD NOR GATES |
| U 13 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 14 | UEN0-10124 | 1 | 04713 | MC10124P | MC10124P QUAD TTL TO ECL |
| U 15 | UEN0-10124 | 1 | 04713 | MC10124P | MC10124P QUAD TTL TO ECL |
| U 16 | UTN0-05922 | 1 | 01295 | SN74HC592N | 74HC592N;8 BIT;COUNTER |
| U 17 | UTN0-05922 | 1 | 01295 | SN74HC592N | 74HC592N;8 BIT;COUNTER |
| U 18 | UEN0-10124 | 1 | 04713 | MC10124P | MC10124P QUAD TTL TO ECL |
| U 19 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 20 | UEN0-10125 | 1 | 04713 | MC10125P | MC10125P QUAD ECL TO TTL |
| U 21 | UTN0-00002 | 1 | 18714 | 74HC00E | 74HC00;QUAD 2IN NAND GTE |
| U 22 | LD4S-00050 | 1 | 22519 | 1505-5B | 4 TAP 5 NS DELAY LINE |

**Parts List for 120BA12501 PULSE GENERATOR PCA Rev B (A5A1)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| U 23 | UTN0-05922 | 1 | 01295 | SN74HC592N | 74HC592N;8 BIT;COUNTER |
| U 24 | UEN0-10125 | 1 | 04713 | MC10125P | MC10125P QUAD ECL TO TTL |
| U 25 | UTN0-05922 | 1 | 01295 | SN74HC592N | 74HC592N;8 BIT;COUNTER |
| U 26 | UTN0-05922 | 1 | 01295 | SN74HC592N | 74HC592N;8 BIT;COUNTER |
| U 27 | UTN0-05922 | 1 | 01295 | SN74HC592N | 74HC592N;8 BIT;COUNTER |
| U 28 | UTN0-00272 | 1 | 01295 | SN74HC27N | 74HC27N 3X3IN NOR GATES |
| U 33 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |

**Parts List for 120BA09401 AM/FM DRIVER PCA Rev A (A6)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS09400 | Ref | 58900 | 120BS09400 | AM/FM DRIVER SCH |
| 1 | 120CF09400 | 1 | 58900 | 120CF09400 | AM/FM DRIVER PCB |
| 2 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| C 1 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 2 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 6 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 7 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 21 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 22 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 23 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 24 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 25 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 27 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 30 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 31 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 32 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 33 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 34 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 35 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 36 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 37 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 38 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 40 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 41 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 42 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 43 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 44 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 45 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 46 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 47 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 48 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 49 | CE16-R6330 | 1 | 55680 | UVP1C330MAA | 33 UF 16V NON-POL RADIA |
| C 50 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 51 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 52 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 53 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 54 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 55 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 56 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 57 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

### Parts List for 120BA09401 AM/FM DRIVER PCA Rev A (A6)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 58 | CC50-00047 | 1 | 51642 | 100-100-COG-479J | 4.7 PF CERAMIC NPO |
| C 59 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 60 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 61 | CC50-00047 | 1 | 51642 | 100-100-COG-479J | 4.7 PF CERAMIC NPO |
| C 62 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 64 | CC50-00047 | 1 | 51642 | 100-100-COG-479J | 4.7 PF CERAMIC NPO |
| C 65 | CC50-00047 | 1 | 51642 | 100-100-COG-479J | 4.7 PF CERAMIC NPO |
| CR 1 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 2 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 3 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 4 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| J 3 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| J 4 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| J 5 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| J 6 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| R 1 | RN55-06040 | 1 | 81349 | RN55C6040F | 604 OHMS 1% MET FILM |
| R 2 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 3 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 6 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 7 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 8 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 9 | RN55-13160 | 1 | 81349 | RN55C3161F | 3.16 K OHMS 1% MET FILM |
| R 10 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 11 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 12 | RN55-11210 | 1 | 81349 | RN55C1211F | 1.21 K OHMS 1% MET FILM |
| R 13 | RN55-11210 | 1 | 81349 | RN55C1211F | 1.21 K OHMS 1% MET FILM |
| R 14 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 15 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 16 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 17 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 18 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 19 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 20 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 23 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 24 | RN55-03010 | 1 | 81349 | RN55C3010F | 301 OHMS 1% MET FILM |
| R 25 | RN55-11500 | 1 | 81349 | RN55C1501F | 1.5 K OHMS 1% MET FILM |
| R 26 | RN55-11500 | 1 | 81349 | RN55C1501F | 1.5 K OHMS 1% MET FILM |
| R 27 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 28 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 29 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 30 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 31 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 32 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 33 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 34 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 35 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 36 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 37 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 38 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 39 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 40 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 41 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 42 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 43 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 44 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 45 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |

**Parts List for 120BA09401 AM/FM DRIVER PCA Rev A (A6)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 46 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 47 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 48 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 49 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 50 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 51 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 52 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 53 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 54 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 55 | RN50-01000 | 1 | 65940 | CRB20FX1000 | 100;M F;1/5W;1%;100PPM |
| R 56 | RN50-01000 | 1 | 65940 | CRB20FX1000 | 100;M F;1/5W;1%;100PPM |
| R 57 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 58 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 59 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 60 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 61 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 62 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 63 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 64 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 65 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 66 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 67 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 68 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 69 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| U 1 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| U 2 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| U 3 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 4 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 5 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 6 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 7 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| U 8 | ULN0-00539 | 1 | 7M800 | AD539JN | AD539;LINEAR MULT/DIVIDR |
| U 9 | UVNP-00100 | 1 | 24355 | AD587JQ | AD587;10V REF |
| U 10 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 11 | UON0-00428 | 1 | 1ES66 | MAX428CPA | MAX428CPA;DUAL OP AMP |
| U 13 | UON0-00428 | 1 | 1ES66 | MAX428CPA | MAX428CPA;DUAL OP AMP |
| U 14 | ULN0-00539 | 1 | 7M800 | AD539JN | AD539;LINEAR MULT/DIVIDR |
| U 15 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 16 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 17 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 18 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 19 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 20 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 21 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 22 | UON0-00428 | 1 | 1ES66 | MAX428CPA | MAX428CPA;DUAL OP AMP |
| U 23 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 24 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| U 25 | UON0-00428 | 1 | 1ES66 | MAX428CPA | MAX428CPA;DUAL OP AMP |
| U 26 | UON0-00428 | 1 | 1ES66 | MAX428CPA | MAX428CPA;DUAL OP AMP |

### Parts List for 120BA12601 FUNCTION GENERATOR PCA Rev B (A6A1)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS12601 | Ref | 58900 | 120BS12601 | FUNCTION GENERATOR SCH |
| 1 | 120CF12600 | 1 | 58900 | 120CF12600 | FUNCTION GENERATOR PCB |
| 2 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| 3 | HSTS-44005 | 3 | 55566 | 3048-B-440-A-0 | 5/16 ROUND SWAGE SPACER |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 21 | CC50-02270 | 1 | 51642 | 200-100-X7R-272K | .0027 UF CERAMIC X7R |
| C 22 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 23 | CC50-02270 | 1 | 51642 | 200-100-X7R-272K | .0027 UF CERAMIC X7R |
| C 24 | CE16-R6330 | 1 | 55680 | UVP1C330MAA | 33 UF 16V NON-POL RADIA |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 27 | CE16-R6330 | 1 | 55680 | UVP1C330MAA | 33 UF 16V NON-POL RADIA |
| C 28 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 29 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 30 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 31 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 32 | CC50-02270 | 1 | 51642 | 200-100-X7R-272K | .0027 UF CERAMIC X7R |
| C 33 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 34 | CE16-R6330 | 1 | 55680 | UVP1C330MAA | 33 UF 16V NON-POL RADIA |
| C 35 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 36 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 37 | CE16-R6330 | 1 | 55680 | UVP1C330MAA | 33 UF 16V NON-POL RADIA |
| C 38 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 40 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 42 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 43 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 44 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 45 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 46 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 47 | CC50-01470 | 1 | 51642 | 150-100-COG-471 | 470 PF CERAMIC NPO |
| C 48 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 49 | CC50-01470 | 1 | 51642 | 150-100-COG-471 | 470 PF CERAMIC NPO |
| C 51 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 52 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 53 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 54 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 55 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

**Parts List for 120BA12601 FUNCTION GENERATOR PCA Rev B (A6A1)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| L 1 | LAD0-06100 | 1 | 72259 | WEE-10 | 10 UH INDUCTOR |
| L 2 | LAD0-06100 | 1 | 72259 | WEE-10 | 10 UH INDUCTOR |
| L 3 | LAD0-06100 | 1 | 72259 | WEE-10 | 10 UH INDUCTOR |
| L 4 | LAD0-06100 | 1 | 72259 | WEE-10 | 10 UH INDUCTOR |
| P 3 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| P 4 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| P 5 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| P 6 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| Q 1 | QBNS-04275 | 1 | 27014 | PN4275 | PN4275 .1A 15V .6W NPN |
| Q 2 | QBNS-04275 | 1 | 27014 | PN4275 | PN4275 .1A 15V .6W NPN |
| R 1 | RN55-17500 | 1 | 81349 | RN55C7501F | 7.5 K OHMS 1% MET FILM |
| R 2 | RN55-00182 | 1 | 81349 | RN55C18R2F | 18.2 OHMS 1% MET FILM |
| R 3 | RN55-00825 | 1 | 81349 | RN55C82R5F | 82.5 OHMS 1% MET FILM |
| R 4 | RAPD-25000 | 1 | 73138 | 89PR50K | 50K POT 15T PC MNT |
| R 5 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 6 | RN50-13320 | 1 | 65940 | CRB20FX3321 | 3.32K;M F;1/5W;1%;100PPM |
| R 9 | RAPD-25000 | 1 | 73138 | 89PR50K | 50K POT 15T PC MNT |
| R 10 | RN55-17500 | 1 | 81349 | RN55C7501F | 7.5 K OHMS 1% MET FILM |
| R 11 | RN55-00182 | 1 | 81349 | RN55C18R2F | 18.2 OHMS 1% MET FILM |
| R 12 | RN55-00825 | 1 | 81349 | RN55C82R5F | 82.5 OHMS 1% MET FILM |
| R 13 | RAPD-25000 | 1 | 73138 | 89PR50K | 50K POT 15T PC MNT |
| R 14 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 15 | RN50-13320 | 1 | 65940 | CRB20FX3321 | 3.32K;M F;1/5W;1%;100PPM |
| R 18 | RAPD-25000 | 1 | 73138 | 89PR50K | 50K POT 15T PC MNT |
| R 19 | RN55-00825 | 1 | 81349 | RN55C82R5F | 82.5 OHMS 1% MET FILM |
| R 20 | RN55-00825 | 1 | 81349 | RN55C82R5F | 82.5 OHMS 1% MET FILM |
| R 21 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 22 | RN55-02210 | 1 | 81349 | RN55C2210F | 221 OHMS 1% MET FILM |
| R 23 | RN55-02210 | 1 | 81349 | RN55C2210F | 221 OHMS 1% MET FILM |
| R 24 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 25 | RN55-00511 | 1 | 81349 | RN55C51R1F | 51.1 OHMS 1% MET FILM |
| R 26 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 27 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 28 | RN55-00511 | 1 | 81349 | RN55C51R1F | 51.1 OHMS 1% MET FILM |
| R 29 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 30 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 31 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 32 | RN55-13010 | 1 | 81349 | RN55C3011F | 3.01 K OHMS 1% MET FILM |
| R 33 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 34 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 35 | RN55-13010 | 1 | 81349 | RN55C3011F | 3.01 K OHMS 1% MET FILM |
| R 36 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 37 | RN55-31100 | 1 | 81349 | RN55C1103F | 110 K OHMS 1% MET FILM |
| R 38 | RN55-31100 | 1 | 81349 | RN55C1103F | 110 K OHMS 1% MET FILM |
| U 1 | UGZ0-02334 | 1 | IDN14 | Q2334I-Z0 | DUAL DIGITAL SYNTHESIZER |
| U 2 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 3 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 4 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 5 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 6 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 7 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 8 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |
| U 9 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |
| U 10 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |
| U 11 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |
| U 12 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |
| U 13 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |

**Parts List for 120BA12601 FUNCTION GENERATOR PCA Rev B (A6A1)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| U 14 | UTN0-01322 | 1 | 01295 | SN74HC132N | SN74HC132N 4X SCHMIDT NA |
| U 15 | UIN0-09713 | 1 | 24355 | AD9713JN | AD9713JN;DAC;12 BIT |
| U 16 | UON0-00428 | 1 | 1ES66 | MAX428CPA | MAX428CPA;DUAL OP AMP |
| U 17 | UEN0-10125 | 1 | 04713 | MC10125P | MC10125P QUAD ECL TO TTL |
| U 18 | UIN0-09713 | 1 | 24355 | AD9713JN | AD9713JN;DAC;12 BIT |
| U 19 | UON0-00428 | 1 | 1ES66 | MAX428CPA | MAX428CPA;DUAL OP AMP |
| U 20 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 21 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| XU 1 | JSG0-11068 | 1 | 71468 | LCS-68-02 | 68 PIN PLCC SOCKET |

**Parts List for 120BA15600 SCAN MODULATION PCA Rev A1 (A7)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF15600 | 1 | 58900 | 120CF15600 | SCAN MODULATION PCB |
| 2 | ETST-06224 | 7 | 88245 | 1280B | TURRET TERMINAL |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CE25-R6330 | 1 | 74840 | 336BPR025M | 33 UF 25V NON-POL RADIAL |
| C 3 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-00047 | 1 | 51642 | 100-100-COG-479J | 4.7 PF CERAMIC NPO |
| C 7 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 8 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 10 | CC50-01150 | 1 | 51642 | 150-100-COG-151J | 150 PF CERAMIC NPO |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 22 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 23 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 24 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 27 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 28 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 29 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 30 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 32 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 33 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 34 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 35 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 37 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 38 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 40 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 41 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 42 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 43 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 44 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 46 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 48 | CC50-00100 | 1 | 51642 | 100-100-COG-100J | 10 PF CERAMIC NPO |
| C 49 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 50 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 51 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 53 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 55 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 56 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 57 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 58 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 59 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 60 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 61 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 62 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 66 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

**Parts List for 120BA15600 SCAN MODULATION PCA Rev A1 (A7)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 67 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 68 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 69 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 70 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 71 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 72 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 75 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 76 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 77 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 78 | CC50-01750 | 1 | 51642 | 200-100-NPO-751J | 750 PF CERAMIC NPO |
| CR 1 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CR 2 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 3 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 4 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CX 31 | CC50-????? | 1 | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| CX 45 | CC50-????? | 1 | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| L 1 | LAD0-05150 | 1 | 72259 | WEE-1.5 | 1.5 UH INDUCTOR |
| L 3 | LAD0-05150 | 1 | 72259 | WEE-1.5 | 1.5 UH INDUCTOR |
| L 5 | LAD0-06220 | 1 | 72259 | WEE-22 | 22 UH INDUCTOR |
| L 6 | LAD0-06220 | 1 | 72259 | WEE-22 | 22 UH INDUCTOR |
| P 1 | JIA2-06235 | 1 |  | 2406-6122 | 6 PIN STRIPLINE PLUG |
| P 2 | JIR2-02230 | 1 | 55322 | TSW-101-08-S-D-RA | 2 PIN STRIPLINE PLUG |
| R 1 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 2 | RN50-21500 | 1 | 81349 | RN50D1502F | 15.0 K OHMS 1% MET FILMM |
| R 3 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 4 | RAPG-25000 | 1 | 32997 | 3296Z-503 | 50K;10%;25T POT |
| R 5 | RN55-31870 | 1 | 81349 | RN55C1873F | 187 K OHMS 1% MET FILM |
| R 6 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 7 | RN50-41000 | 1 | 65940 | CRB20FX1004 | 1.00M;M F;1/5W;1%;100PPM |
| R 8 | RN50-23320 | 1 | 65940 | CRB20FX3322 | 33.2K;M F;1/5W;1%;100PPM |
| R 9 | RAPG-25000 | 1 | 32997 | 3296Z-503 | 50K;10%;25T POT |
| R 10 | RN50-19090 | 1 | 65940 | CRB20FX9091 | 9.09K;M F;1/5W;1%;100PPM |
| R 11 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 12 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 13 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 14 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 15 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 16 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 17 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 19 | RAPG-15000 | 1 | 32997 | 3296Z-1-502 | 5K 10% 25T .5W TRIM. POT |
| R 20 | RN50-23320 | 1 | 65940 | CRB20FX3322 | 33.2K;M F;1/5W;1%;100PPM |
| R 21 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 22 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 24 | RN50-18250 | 1 | 81349 | RN50D8251F | 8.25 K OHMS 1% MET FILM |
| R 25 | RAPG-31000 | 1 | 32997 | 3296Z-1-104 | 100K 10% 25T .5W TRM POT |
| R 27 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 28 | RN50-13160 | 1 | 81349 | RN50D3161F | 3.16 K OHMS 1% MET FILM |
| R 29 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 30 | RN50-11100 | 1 | 81349 | RN50D1101F | 1.10 K OHMS 1% MET FILM |
| R 32 | RN50-22260 | 1 | 81349 | RN50D2262F | 22.6 K OHMS 1% MET FILM |
| R 33 | RN50-17500 | 1 | 81349 | RN50D7501F | 7.50 K OHMS 1% MET FILM |
| R 34 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 35 | RN50-00825 | 1 | 81349 | RN50D82R5F | 82.5 OHMS 1% METAL FILM |
| R 36 | RN50-17500 | 1 | 81349 | RN50D7501F | 7.50 K OHMS 1% MET FILM |
| R 37 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 38 | RN50-00825 | 1 | 81349 | RN50D82R5F | 82.5 OHMS 1% METAL FILM |
| R 39 | RN55-21050 | 1 | 81349 | RN55C1052F | 10.5 K OHMS 1% MET FILM |

### Parts List for 120BA15600 SCAN MODULATION PCA Rev A1 (A7)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 40 | RN50-16190 | 1 | 81349 | RN50D6191F | 6.19 K OHMS 1% MET FILM |
| R 41 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 42 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 43 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 44 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 45 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 46 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 47 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 48 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 49 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 50 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 51 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 52 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 53 | RN50-00825 | 1 | 81349 | RN50D82R5F | 82.5 OHMS 1% METAL FILM |
| R 54 | RN50-17500 | 1 | 81349 | RN50D7501F | 7.50 K OHMS 1% MET FILM |
| R 55 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 56 | RN50-00825 | 1 | 81349 | RN50D82R5F | 82.5 OHMS 1% METAL FILM |
| R 57 | RN55-36190 | 1 | 81349 | RN55C6193F | 619 K OHMS 1% MET FILM |
| R 58 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 59 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 60 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 61 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 62 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 63 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 64 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 65 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 67 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 68 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 69 | RN55-00221 | 1 | 81349 | RN55C22R1F | 22.1 OHMS 1% MET FILM |
| R 70 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 71 | RN50-11300 | 1 | 81349 | RN50D1301F | 1.30 K OHMS 1% MET FILM |
| R 72 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 73 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 74 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| U 1 | UOG0-00111 | 1 | 24355 | OPA 111BM | OPA111BM JFET OPAMP |
| U 2 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| U 3 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 4 | UAN0-08048 | 1 | 32293 | ICL8048CCJE | AMP;LOG;16 PIN |
| U 5 | UON0-00844 | 1 | 24355 | AD844AN | AD844AN;OP AMP |
| U 6 | UVNP-00100 | 1 | 24355 | AD587JQ | AD587;10V REF |
| U 7 | UIN0-75453 | 1 | 01295 | SN75453BP | SN75453BP DUAL DRIVER |
| U 8 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 9 | UTN0-01322 | 1 | 01295 | SN74HC132N | SN74HC132N 4X SCHMIDT NA |
| U 10 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 11 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 12 | UIN0-00773 | 1 | 71785 | AD773J | AD773 10 BIT CMOS A/D |
| U 13 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 14 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 15 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 16 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |
| U 17 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |
| U 18 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |
| U 19 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 20 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 21 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |
| U 22 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |
| U 23 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |

**Parts List for 120BA15600 SCAN MODULATION PCA Rev A1 (A7)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| U 24 | UMN0-71681 | 1 | 61772 | IDT71681SA35 | IDT71681;4K x 4 RAM |
| U 25 | UIN0-09713 | 1 | 24355 | AD9713JN | AD9713JN;DAC;12 BIT |
| U 26 | UON0-00844 | 1 | 24355 | AD844AN | AD844AN;OP AMP |
| U 27 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 28 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 29 | UIN0-09713 | 1 | 24355 | AD9713JN | AD9713JN;DAC;12 BIT |
| U 30 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 31 | UON0-00844 | 1 | 24355 | AD844AN | AD844AN;OP AMP |
| U 32 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| W 1 | JJF0-02000 | 1 | 22526 | 89F4578 | TWO CONTACT JUMPER |
| W 2 | JJF0-02000 | 1 | 22526 | 89F4578 | TWO CONTACT JUMPER |

### Parts List for 120BA09211 ANALOG SWEEP 1 PCA Rev A (A8)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS09211 | Ref | 58900 | 120BS09211 | ANALOG SWEEP 1 SCH |
| 1 | 120CF09210 | 1 | 58900 | 120CF09210 | ANALOG SWEEP 1 PCB |
| 2 | ETST-06224 | 2 | 88245 | 1280B | TURRET TERMINAL |
| 3 | JJF0-02000 | 1 | 22526 | 89F4578 | TWO CONTACT JUMPER |
| 101 | HBPP-44005 | 1 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 102 | HWFS-40400 | 1 | 96906 | MS15795-803 | #4 X 1/4 FLAT WASHER |
| 103 | HWSS-40300 | 1 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| A8 A1 | 120BA11401 | 1 | 58900 | 120BA11401 | ANALOG SWEEP #2 PCA |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 3 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 8 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 12 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 13 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 14 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 15 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 16 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 19 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 20 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 24 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 25 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 26 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 27 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 28 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 29 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 30 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 31 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 32 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 33 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 35 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 36 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 38 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 40 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 41 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 42 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 43 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 44 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 45 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 46 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 48 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 49 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 50 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 51 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 56 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

**Parts List for 120BA09211 ANALOG SWEEP 1 PCA Rev A (A8)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 57 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 58 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 59 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 60 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 61 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 64 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 65 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 66 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 67 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 68 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 69 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 70 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 71 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 72 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 73 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 74 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 76 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 77 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 78 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 79 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 81 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 82 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 83 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 84 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 85 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 87 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 88 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 89 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 90 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 91 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 92 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 93 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| CR 3 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| IR 1 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 2 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 3 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 4 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 5 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 6 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 7 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 8 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| J 3 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| P 1 | JIA1-03230 | 1 | 52072 | CA-503-23B-43 | 3 PIN STRIPLINE PLUG |
| R 1 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 3 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 5 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 7 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 9 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 10 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 11 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 12 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 13 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 14 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 15 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 16 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 17 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |

**Parts List for 120BA09211 ANALOG SWEEP 1 PCA Rev A (A8)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 24 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 25 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 26 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 27 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 28 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 29 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 30 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 31 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 32 | RN50-19090 | 1 | 65940 | CRB20FX9091 | 9.09K;M F;1/5W;1%;100PPM |
| R 33 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 34 | RN55-17500 | 1 | 81349 | RN55C7501F | 7.5 K OHMS 1% MET FILM |
| R 35 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 36 | RN55-26650 | 1 | 81349 | RN55C6652F | 66.5 K OHMS 1% MET FILM |
| R 37 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 38 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 39 | RAPG-41000 | 1 | 32997 | 3296Z-1-105 | 1M 10% 25T .5W TRIM. POT |
| R 40 | RN50-22000 | 1 | 65940 | CRB20FX2002 | 20.0K;M F;1/5W;1%;100PPM |
| R 41 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 42 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 43 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 44 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 45 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 46 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 47 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 48 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 49 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 50 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 51 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 52 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 53 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 54 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 55 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 56 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 57 | RN55-34420 | 1 | 81349 | RN55C4423F | 442 K OHMS 1% MET FILM |
| R 58 | RAPG-15000 | 1 | 32997 | 3296Z-1-502 | 5K 10% 25T .5W TRIM. POT |
| R 60 | RN50-00100 | 1 | 65940 | CRB20FX10R0 | 10.0;M F;1/5W;1%;100PPM |
| R 61 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 62 | RN55-02210 | 1 | 81349 | RN55C2210F | 221 OHMS 1% MET FILM |
| R 63 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 64 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 65 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| RM 1 | RM5S-14700 | 1 | 71450 | 750-61-R4.7K | 5 X 4.7K SIP RESISTOR NE |
| RM 2 | RM7S-21000 | 1 | 71450 | 750-81-R10K | 10K OHM X 7 SIP NETWRK |
| RX 2 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 4 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 6 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 8 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| U 1 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 2 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 4 | ULN0-00004 | 1 | PMI | CMP04FP | CMP04;QUAD COMPARATOR |
| U 5 | UTN0-00862 | 1 | 01295 | 74HC86N | QUAD 2 INPUT X OR GATE |
| U 6 | UTN0-00862 | 1 | 01295 | 74HC86N | QUAD 2 INPUT X OR GATE |
| U 7 | UTN0-00322 | 1 | 18714 | 74HC32E | QUAD 2 INPUT OR GATE |
| U 8 | UTN0-00742 | 1 | 18714 | 74HC74E | DUAL D FLIP-FLOPS |
| U 11 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 12 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 14 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |

**Parts List for 120BA09211 ANALOG SWEEP 1 PCA Rev A (A8)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| U 15 | UTN0-00022 | 1 | 18714 | 74HC02E | QUAD 2 INPUT NOR GATE |
| U 16 | UTN0-00091 | 1 | 01295 | SN74LS09N | 74LS09 QUAD AND GATES |
| U 17 | UVNP-00100 | 1 | 24355 | AD587JQ | AD587;10V REF |
| U 18 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 19 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 20 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 21 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 22 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 23 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 24 | UTN0-01232 | 1 | 01295 | SN74HC123 | RETRIG. MULTIVIBRATOR |
| U 25 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 26 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 27 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 28 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 29 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 32 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 33 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 34 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 35 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 36 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 37 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 38 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 39 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 40 | ULN0-00004 | 1 | PMI | CMP04FP | CMP04;QUAD COMPARATOR |
| U 41 | ULN0-00004 | 1 | PMI | CMP04FP | CMP04;QUAD COMPARATOR |
| U 42 | ULN0-00004 | 1 | PMI | CMP04FP | CMP04;QUAD COMPARATOR |
| U 43 | ULN0-00004 | 1 | PMI | CMP04FP | CMP04;QUAD COMPARATOR |
| U 44 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 45 | UCN0-04078 | 1 | 01295 | SN74HC4078 | 74HC4078;8 IN NOR GATE |
| U 46 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 47 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |

### Parts List for 120BA09212 ANALOG SWEEP 1 PCA -40GH Rev A (A8)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS09212 | Ref | 58900 | 120BS09212 | ANALOG SWEEP 1 SCH -40GH |
| 1 | 120CF09210 | 1 | 58900 | 120CF09210 | ANALOG SWEEP 1 PCB |
| 2 | ETST-06224 | 2 | 88245 | 1280B | TURRET TERMINAL |
| 3 | JJF0-02000 | 1 | 22526 | 89F4578 | TWO CONTACT JUMPER |
| 101 | HBPP-44005 | 1 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 102 | HWFS-40400 | 1 | 96906 | MS15795-803 | #4 X 1/4 FLAT WASHER |
| 103 | HWSS-40300 | 1 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| A8 A1 | 120BA11401 | 1 | 58900 | 120BA11401 | ANALOG SWEEP #2 PCA |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 3 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 8 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 12 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 13 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 14 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 15 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 16 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 19 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 20 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 24 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 25 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 26 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 27 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 28 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 29 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 30 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 31 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 32 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 33 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 35 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 36 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 38 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 40 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 41 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 42 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 43 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 44 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 45 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 46 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 48 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 49 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 50 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 51 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 56 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

**Parts List for 120BA09212 ANALOG SWEEP 1 PCA -40GH Rev A (A8)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 57 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 58 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 59 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 60 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 61 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 64 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 65 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 66 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 67 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 68 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 69 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 70 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 71 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 72 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 73 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 74 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 76 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 77 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 78 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 79 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 81 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 82 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 83 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 84 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 85 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 87 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 88 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 89 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 90 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 91 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 92 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 93 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| CR 3 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| IR 1 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 2 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 3 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 4 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 5 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 6 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 7 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| IR 8 | DZAC-05294 | 1 | 04713 | IN5294 | IN5294 .75mA REG DIODE |
| J 3 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| P 1 | JIA1-03230 | 1 | 52072 | CA-503-23B-43 | 3 PIN STRIPLINE PLUG |
| R 1 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 3 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 5 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 7 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 9 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 10 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 11 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 12 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 13 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 14 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 15 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 16 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 17 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |

**Parts List for 120BA09212 ANALOG SWEEP 1 PCA -40GH Rev A (A8)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 24 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 25 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 26 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 27 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 28 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 29 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 30 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 31 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 32 | RN50-19090 | 1 | 65940 | CRB20FX9091 | 9.09K;M F;1/5W;1%;100PPM |
| R 33 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 34 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 35 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 36 | RN55-28250 | 1 | 81349 | RN55C8252F | 82.5 K OHMS 1% MET FILM |
| R 37 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 38 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 39 | RAPG-41000 | 1 | 32997 | 3296Z-1-105 | 1M 10% 25T .5W TRIM. POT |
| R 40 | RN50-22000 | 1 | 65940 | CRB20FX2002 | 20.0K;M F;1/5W;1%;100PPM |
| R 41 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 42 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 43 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 44 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 45 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 46 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 47 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 48 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| R 49 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 50 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 51 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 52 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 53 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 54 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 55 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 56 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 57 | RN55-35760 | 1 | 81349 | RN55C5763F | 576 K OHMS 1% MET FILM |
| R 58 | RAPG-15000 | 1 | 32997 | 3296Z-1-502 | 5K 10% 25T .5W TRIM. POT |
| R 60 | RN50-00100 | 1 | 65940 | CRB20FX10R0 | 10.0;M F;1/5W;1%;100PPM |
| R 61 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 62 | RN55-00110 | 1 | 81349 | RN55C11R0F | 11.0 OHMS 1% MET FILM |
| R 63 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 64 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 65 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| RM 1 | RM5S-14700 | 1 | 71450 | 750-61-R4.7K | 5 X 4.7K SIP RESISTOR NE |
| RM 2 | RM7S-21000 | 1 | 71450 | 750-81-R10K | 10K OHM X 7 SIP NETWRK |
| RX 2 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 4 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 6 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 8 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| U 1 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 2 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 4 | ULN0-00004 | 1 | PMI | CMP04FP | CMP04;QUAD COMPARATOR |
| U 5 | UTN0-00862 | 1 | 01295 | 74HC86N | QUAD 2 INPUT X OR GATE |
| U 6 | UTN0-00862 | 1 | 01295 | 74HC86N | QUAD 2 INPUT X OR GATE |
| U 7 | UTN0-00322 | 1 | 18714 | 74HC32E | QUAD 2 INPUT OR GATE |
| U 8 | UTN0-00742 | 1 | 18714 | 74HC74E | DUAL D FLIP-FLOPS |
| U 11 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 12 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 14 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |

### Parts List for 120BA09212 ANALOG SWEEP 1 PCA -40GH Rev A (A8)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| U 15 | UTN0-00022 | 1 | 18714 | 74HC02E | QUAD 2 INPUT NOR GATE |
| U 16 | UTN0-00091 | 1 | 01295 | SN74LS09N | 74LS09 QUAD AND GATES |
| U 17 | UVNP-00100 | 1 | 24355 | AD587JQ | AD587;10V REF |
| U 18 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 19 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 20 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 21 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 22 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 23 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 24 | UTN0-01232 | 1 | 01295 | SN74HC123 | RETRIG. MULTIVIBRATOR |
| U 25 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 26 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 27 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 28 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 29 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 32 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 33 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 34 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 35 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 36 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 37 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 38 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 39 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 40 | ULN0-00004 | 1 | PMI | CMP04FP | CMP04;QUAD COMPARATOR |
| U 41 | ULN0-00004 | 1 | PMI | CMP04FP | CMP04;QUAD COMPARATOR |
| U 42 | ULN0-00004 | 1 | PMI | CMP04FP | CMP04;QUAD COMPARATOR |
| U 43 | ULN0-00004 | 1 | PMI | CMP04FP | CMP04;QUAD COMPARATOR |
| U 44 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 45 | UCN0-04078 | 1 | 01295 | SN74HC4078 | 74HC4078;8 IN NOR GATE |
| U 46 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 47 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |

**Parts List for 120BA11401 ANALOG SWEEP #2 PCA Rev A (A8A1)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS11401 | Ref | 58900 | 120BS11401 | ANALOG SWEEP #2 SCH |
| 1 | 120BF11400 | 1 | 58900 | 120BF11400 | ANALOG SWEEP #2 PCB |
| 2 | HSTS-44005 | 1 | 55566 | 3048-B-440-A-0 | 5/16 ROUND SWAGE SPACER |
| C 1 | CF00-05200 | 1 | 58377 | FA6205J100 | 2 UF 100V POLYPROPYLENE |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-01470 | 1 | 51642 | 150-100-COG-471 | 470 PF CERAMIC NPO |
| CR 1 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 2 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CX 2 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| CX 3 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| P 3 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| Q 1 | QMPS-00164 | 1 | 17856 | 3N164 | 3N164;P CHNL MOS FET |
| R 1 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 2 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 3 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 4 | RN55-34990 | 1 | 81349 | RN55C4993F | 499 K OHMS 1% MET FILM |
| R 5 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 6 | RN55-34990 | 1 | 81349 | RN55C4993F | 499 K OHMS 1% MET FILM |
| R 7 | RN55-34990 | 1 | 81349 | RN55C4993F | 499 K OHMS 1% MET FILM |
| R 8 | RN55-24990 | 1 | 81349 | RN55C4992F | 49.9 K OHMS 1% MET FILM |
| R 9 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 10 | RN55-24990 | 1 | 81349 | RN55C4992F | 49.9 K OHMS 1% MET FILM |
| R 11 | WJIB-05022 | 1 | 53387 | 923345-05 | .5' INSULATED JUMPER |
| R 12 | RN55-13320 | 1 | 81349 | RN55C3321F | 3.32 K OHMS 1% MET FILM |
| R 13 | RN55-22000 | 1 | 81349 | RN55C2002F | 20 K OHMS 1% MET FILM |
| R 14 | RN55-22000 | 1 | 81349 | RN55C2002F | 20 K OHMS 1% MET FILM |
| R 15 | RN55-18250 | 1 | 81349 | RN55C8251F | 8.25 K OHMS 1% MET FILM |
| R 16 | RN55-21330 | 1 | 81349 | RN55C1332F | 13.3 K OHMS 1% MET FILM |
| R 17 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| U 1 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 2 | UON0-00712 | 1 | 24355 | AD712JN | AD712JN;DUAL OP AMP |
| U 3 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 4 | UON0-00712 | 1 | 24355 | AD712JN | AD712JN;DUAL OP AMP |

**Parts List for 120BA09100 DIGITAL RAMP PCA Rev F (A9)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF09100 | 1 | 58900 | 120CF09100 | DIGITAL RAMP PCB |
| 2 | ETST-06224 | 4 | 88245 | 1280B | TURRET TERMINAL |
| 3 | JJF0-02000 | 2 | 22526 | 89F4578 | TWO CONTACT JUMPER |
| C 1 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 2 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 3 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 4 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 5 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 6 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 7 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 8 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 9 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 24 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 27 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 28 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 29 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 30 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 31 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 32 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 33 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 34 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 36 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 37 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 38 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 40 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 41 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 42 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 43 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 44 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 45 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 46 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 47 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 48 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 49 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 50 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 51 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 52 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 53 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 54 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 55 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |

**Parts List for 120BA09100 DIGITAL RAMP PCA Rev F (A9)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 56 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 57 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 58 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 59 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 60 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 61 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 62 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 64 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 65 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 66 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 67 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 68 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 69 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 70 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 71 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 72 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 73 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 74 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 75 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 76 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 77 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 78 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| CR 1 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 2 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 3 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 4 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 5 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 6 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 7 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 8 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 9 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 10 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 11 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 12 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 13 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 14 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 15 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| P 1 | JIA1-03230 | 1 | 52072 | CA-503-23B-43 | 3 PIN STRIPLINE PLUG |
| P 2 | JIA1-03230 | 1 | 52072 | CA-503-23B-43 | 3 PIN STRIPLINE PLUG |
| R 1 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 2 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 3 | RAPG-11000 | 1 | 32997 | 3296Z-102 | 1K;10%;25T POT |
| R 5 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 6 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 7 | RN55-21330 | 1 | 81349 | RN55C1332F | 13.3 K OHMS 1% MET FILM |
| R 8 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 9 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 10 | RN50-41000 | 1 | 65940 | CRB20FX1004 | 1.00M;M F;1/5W;1%;100PPM |
| R 11 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 12 | RAPG-11000 | 1 | 32997 | 3296Z-102 | 1K;10%;25T POT |
| R 13 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 14 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 16 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 17 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 18 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 19 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |

**Parts List for 120BA09100 DIGITAL RAMP PCA Rev F (A9)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 20 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 21 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 22 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 23 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 24 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 26 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 27 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 28 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 29 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 30 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 31 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 32 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 33 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 34 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 35 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 36 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 37 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 38 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 39 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 40 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 41 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 42 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 43 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 44 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 45 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 46 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 47 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 48 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 49 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 50 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 51 | RAPG-31000 | 1 | 32997 | 3296Z-1-104 | 100K 10% 25T .5W TRM POT |
| R 52 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 53 | RN50-24990 | 1 | 65940 | CRB20FX4992 | 49.9K;M F;1/5W;1%;100PPM |
| R 54 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 55 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 56 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 57 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 58 | RN55-21330 | 1 | 81349 | RN55C1332F | 13.3 K OHMS 1% MET FILM |
| R 59 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 60 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 61 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 62 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 63 | RN55-21330 | 1 | 81349 | RN55C1332F | 13.3 K OHMS 1% MET FILM |
| R 64 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 65 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 66 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 67 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 68 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 69 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 70 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 71 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 72 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 73 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 74 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 75 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 76 | RN50-13320 | 1 | 65940 | CRB20FX3321 | 3.32K;M F;1/5W;1%;100PPM |
| R 77 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |

**Parts List for 120BA09100 DIGITAL RAMP PCA Rev F (A9)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 78 | RN50-01620 | 1 | 65940 | CRB20FX1620 | 162;M F;1/5W;1%;100PPM |
| R 79 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 80 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 81 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| RX 82 | RN50-????? | 1 | 65940 | CRB20FX???? | SELECTED IN TEST |
| U 1 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 2 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 3 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 4 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 5 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 6 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 7 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 8 | UAN0-00100 | 1 | 13919 | LOG 100JP | LOG 100JP LOG AMP |
| U 9 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 10 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 11 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 12 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 13 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 14 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 15 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 16 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 17 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 18 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 19 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 20 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 21 | UTN0-00022 | 1 | 18714 | 74HC02E | QUAD 2 INPUT NOR GATE |
| U 22 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 23 | UVNP-00100 | 1 | 24355 | AD587JQ | AD587;10V REF |
| U 24 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 25 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 26 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 27 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 28 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 29 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 30 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 31 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 32 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 33 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |

**Parts List for 120BA09101 DIGITAL RAMP PCA Rev B (A9)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS09101 | Ref | 58900 | 120BS09101 | DIGITAL RAMP SCH |
| 1 | 120CF09100 | 1 | 58900 | 120CF09100 | DIGITAL RAMP PCB |
| 2 | ETST-06224 | 4 | 88245 | 1280B | TURRET TERMINAL |
| 3 | JJF0-02000 | 2 | 22526 | 89F4578 | TWO CONTACT JUMPER |
| C 1 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 2 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 3 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 4 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 5 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 6 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 7 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 8 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 9 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 24 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 27 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 28 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 29 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 30 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 31 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 32 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 33 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 34 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 36 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 37 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 38 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 40 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 41 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 42 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 43 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 44 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 45 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 46 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 47 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 48 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 49 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 50 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 51 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 52 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 53 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 54 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

### Parts List for 120BA09101 DIGITAL RAMP PCA Rev B (A9)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 55 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 56 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 57 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 58 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 59 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 60 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 61 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 62 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 64 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 65 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 66 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 67 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 68 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 69 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 70 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 71 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 72 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 73 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 74 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 75 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 76 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 77 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 78 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| CR 1 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 2 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 3 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 4 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 5 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 6 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 7 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 8 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 9 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 10 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 11 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 12 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 13 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 14 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 15 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| P 1 | JIA1-03230 | 1 | 52072 | CA-503-23B-43 | 3 PIN STRIPLINE PLUG |
| P 2 | JIA1-03230 | 1 | 52072 | CA-503-23B-43 | 3 PIN STRIPLINE PLUG |
| R 1 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 2 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 3 | RAPG-11000 | 1 | 32997 | 3296Z-102 | 1K;10%;25T POT |
| R 5 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 6 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 7 | RN50-21500 | 1 | 81349 | RN50D1502F | 15.0 K OHMS 1% MET FILMM |
| R 8 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 9 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 10 | RN50-41000 | 1 | 65940 | CRB20FX1004 | 1.00M;M F;1/5W;1%;100PPM |
| R 11 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 12 | RAPG-11000 | 1 | 32997 | 3296Z-102 | 1K;10%;25T POT |
| R 13 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 14 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 16 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 17 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 18 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |

**Parts List for 120BA09101 DIGITAL RAMP PCA Rev B (A9)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 19 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 20 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 21 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 22 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 23 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 24 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 26 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 27 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 28 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 29 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 30 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 31 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 32 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 33 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 34 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 35 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 36 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 37 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 38 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 39 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 40 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 41 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 42 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 43 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 44 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 45 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 46 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 47 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 48 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 49 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 50 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 51 | RAPG-31000 | 1 | 32997 | 3296Z-1-104 | 100K 10% 25T .5W TRM POT |
| R 52 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 53 | RN50-24990 | 1 | 65940 | CRB20FX4992 | 49.9K;M F;1/5W;1%;100PPM |
| R 54 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 55 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 56 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 57 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 58 | RN55-21330 | 1 | 81349 | RN55C1332F | 13.3 K OHMS 1% MET FILM |
| R 59 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 60 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 61 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 62 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 63 | RN55-21330 | 1 | 81349 | RN55C1332F | 13.3 K OHMS 1% MET FILM |
| R 64 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 65 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 66 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 67 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 68 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 69 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 70 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 71 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 72 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 73 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 74 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 75 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 76 | RN50-13320 | 1 | 65940 | CRB20FX3321 | 3.32K;M F;1/5W;1%;100PPM |

### Parts List for 120BA09101 DIGITAL RAMP PCA Rev B (A9)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 77 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 78 | RN50-01620 | 1 | 65940 | CRB20FX1620 | 162;M F;1/5W;1%;100PPM |
| R 79 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 80 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 81 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 82 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 83 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| U 1 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 2 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 3 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 4 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 5 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 6 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 7 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 8 | UAN0-00100 | 1 | 13919 | LOG 100JP | LOG 100JP LOG AMP |
| U 9 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 10 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 11 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 12 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 13 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 14 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 15 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 16 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 17 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 18 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 19 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 20 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 21 | UTN0-00022 | 1 | 18714 | 74HC02E | QUAD 2 INPUT NOR GATE |
| U 22 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 23 | UVNP-00100 | 1 | 24355 | AD587JQ | AD587;10V REF |
| U 24 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 25 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 26 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 27 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 28 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 29 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 30 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 31 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 32 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 33 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |

**Parts List for 120BA06510 LEVEL PCA Rev D (A10)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS06510 | Ref | 58900 | 120BS06510 | LEVEL SCH |
| 1 | 120CF06510 | 1 | 58900 | 120CF06510 | LEVEL PCB |
| 2 | ETST-06224 | 4 | 88245 | 1280B | TURRET TERMINAL |
| 3 | HQIP-00180 | 2 | 32559 | 121-032 | TO18 INSULATOR |
| 101 | HBPP-44005 | 3 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 102 | HWFS-40400 | 3 | 96906 | MS15795-803 | #4 X 1/4 FLAT WASHER |
| 103 | HWSS-40300 | 3 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| A 10A1 | 120BA15520 | Ref | 58900 | 120BA15520 | LEVEL DRIVER PCA |
| C 1 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 2 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 3 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 4 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 5 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 6 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 7 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 8 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 9 | CC50-01150 | 1 | 51642 | 150-100-COG-151J | 150 PF CERAMIC NPO |
| C 10 | CC50-01150 | 1 | 51642 | 150-100-COG-151J | 150 PF CERAMIC NPO |
| C 11 | CC50-01200 | 1 | 51642 | 150-100-COG-201J | 200 PF CERAMIC NPO |
| C 12 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 13 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 20 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-00150 | 1 | 52763 | EDPT-15-NPO-5% | 15 PF CERAMIC NPO |
| C 24 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 25 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 26 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 27 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 28 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 29 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 30 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 31 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 32 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 33 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 34 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 37 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 38 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 40 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 41 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 42 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 46 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 47 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 48 | CC50-00150 | 1 | 52763 | EDPT-15-NPO-5% | 15 PF CERAMIC NPO |
| C 49 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 52 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 53 | CE16-R6330 | 1 | 55680 | UVP1C330MAA | 33 UF 16V NON-POL RADIA |
| C 54 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 55 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 56 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 57 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 59 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 60 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 61 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

**Parts List for 120BA06510 LEVEL PCA Rev D (A10)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 62 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 64 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 65 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 66 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 67 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 68 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 69 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 70 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 71 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 72 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 73 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 75 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 76 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 77 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 78 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 79 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 85 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 86 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 87 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 88 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 89 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 90 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 91 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 92 | CC50-00680 | 1 | 51642 | 150-100-COG-680J | 68 PF CERAMIC NPO |
| CR 1 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 2 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 3 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CX 51 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| CX 74 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| DS 1 | ILRR-10125 | 1 | 28480 | HLMP-K101 | RED LED |
| J 3 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| J 4 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| J 5 | JIB2-20170 | 1 | 55322 | SLW-110-01-S-D | 20 PIN STRIPLINE SOCKET |
| L 1 | LAD0-06470 | 1 | 72259 | WEE-47 | 47 UH INDUCTOR |
| L 2 | LAD0-06470 | 1 | 72259 | WEE-47 | 47 UH INDUCTOR |
| L 3 | LAD0-07100 | 1 | 72259 | WEE-100 | 100 UH INDUCTOR |
| Q 1 | QMNS-00215 | 1 | 06049 | SD215DE | SD215DE D-MOS FET |
| Q 2 | QMNS-00215 | 1 | 06049 | SD215DE | SD215DE D-MOS FET |
| R 1 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 2 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 3 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 4 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 5 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 6 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 7 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 8 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 10 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 11 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 12 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 13 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 14 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 17 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 18 | RN50-03320 | 1 | 65940 | CRB20FX3320 | 332;M F;1/5W;1%;100PPM |
| R 19 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 20 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 21 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |

**Parts List for 120BA06510 LEVEL PCA Rev D (A10)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 22 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 23 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 24 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 25 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 26 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 27 | RAPG-15000 | 1 | 32997 | 3296Z-1-502 | 5K 10% 25T .5W TRIM. POT |
| R 28 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 29 | RAPG-15000 | 1 | 32997 | 3296Z-1-502 | 5K 10% 25T .5W TRIM. POT |
| R 30 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 31 | RN50-05620 | 1 | 65940 | CRB20FX5620 | 562;M F;1/5W;1%;100PPM |
| R 32 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 33 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 34 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 35 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 36 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 37 | RN50-41000 | 1 | 65940 | CRB20FX1004 | 1.00M;M F;1/5W;1%;100PPM |
| R 38 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 39 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 40 | RN50-11210 | 1 | 81349 | RN50D1211F | 1.21 K OHMS 1% MET FILM |
| R 41 | RN50-21500 | 1 | 81349 | RN50D1502F | 15.0 K OHMS 1% MET FILMM |
| R 42 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 43 | RN50-22000 | 1 | 65940 | CRB20FX2002 | 20.0K;M F;1/5W;1%;100PPM |
| R 44 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 45 | RN50-22000 | 1 | 65940 | CRB20FX2002 | 20.0K;M F;1/5W;1%;100PPM |
| R 46 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 47 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 48 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 49 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 50 | RAPG-25000 | 1 | 32997 | 3296Z-503 | 50K;10%;25T POT |
| R 51 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 52 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 53 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 54 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 55 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 56 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 57 | RN50-13320 | 1 | 65940 | CRB20FX3321 | 3.32K;M F;1/5W;1%;100PPM |
| R 58 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 59 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 60 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 61 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 62 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 63 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 64 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 65 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 66 | RC05-45100 | 1 | 01121 | BB-515-5 | 5.1 M 5% 1/8W CARBON |
| R 68 | WJIB-05022 | 1 | 53387 | 923345-05 | .5' INSULATED JUMPER |
| RX 9 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 15 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 16 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| U 1 | UTN0-00042 | 1 | 01295 | SN74HC04 | SN74HC04 HEX INVERTER |
| U 2 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 3 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| U 5 | UON0-00712 | 1 | 24355 | AD712JN | AD712JN;DUAL OP AMP |
| U 6 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| U 7 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| U 8 | ULN0-00539 | 1 | 7M800 | AD539JN | AD539;LINEAR MULT/DIVIDR |
| U 9 | ULN0-00539 | 1 | 7M800 | AD539JN | AD539;LINEAR MULT/DIVIDR |

**Parts List for 120BA06510 LEVEL PCA Rev D (A10)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| U 10 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 13 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| U 14 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 15 | UON0-00027 | 1 | 24355 | AD OP27GN | OP27GN LOW DRIFT OP AMP |
| U 16 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 17 | UON0-00712 | 1 | 24355 | AD712JN | AD712JN;DUAL OP AMP |
| U 18 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 19 | ULN0-00311 | 1 | 27014 | LM311N | LM311N COMPARATOR |
| U 20 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 21 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 22 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 23 | UTN0-01252 | 1 | 04713 | MC74HC125N | MC74HC125N QUAD BUFFER |
| U 24 | UIN0-07846 | 1 | 24355 | AD7846JN | AD7846JN;16 BIT DAC |
| U 25 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 26 | UVNP-00050 | 1 | 1ES66 | REF02 | VREF;5V +/-25mV;3PPM |
| U 27 | UON0-00027 | 1 | 24355 | AD OP27GN | OP27GN LOW DRIFT OP AMP |
| U 28 | ULN0-00539 | 1 | 7M800 | AD539JN | AD539;LINEAR MULT/DIVIDR |
| U 29 | UON0-00746 | 1 | 24355 | AD746JN | AD746JN;DUAL OP AMP |
| U 30 | UON0-00027 | 1 | 24355 | AD OP27GN | OP27GN LOW DRIFT OP AMP |
| U 31 | UIN0-07524 | 1 | 24355 | AD7524 | AD7524 8 BIT D/A |
| U 32 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| VR 1 | DRAE-00827 | 1 | 04713 | 1N827 | 1N827 6.2V REF. DIODE |
| VR 2 | DRAE-00827 | 1 | 04713 | 1N827 | 1N827 6.2V REF. DIODE |
| VR 3 | DZAD-04728 | 1 | 04713 | 1N4728 | IN4728 3.3 V ZENER |
| Y 1 | Y180-00246 | 1 | 00815 | C1360N | 2.4576MHz CRYSTAL |

### Parts List for 120BA15520 LEVEL DRIVER PCA Rev A (A10A1)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS15520 | Ref | 58900 | 120BS15520 | LEVEL DRIVER SCH |
| 1 | 120BF15520 | 1 | 58900 | 120BF15520 | LEVEL DRIVER PCB |
| 2 | ETSB-06216 | 2 | 88245 | 2000B | BIFURCATED TERMINAL 5/32 |
| 3 | HSTS-44005 | 3 | 55566 | 3048-B-440-A-0 | 5/16 ROUND SWAGE SPACER |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-01330 | 1 | 51642 | 150-100-COG-331J | 330 PF CERAMIC NPO |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 13 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 14 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 15 | CC50-01330 | 1 | 51642 | 150-100-COG-331J | 330 PF CERAMIC NPO |
| C 18 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 24 | CC50-01330 | 1 | 51642 | 150-100-COG-331J | 330 PF CERAMIC NPO |
| C 25 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 26 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 27 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 28 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 29 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 31 | CC50-01330 | 1 | 51642 | 150-100-COG-331J | 330 PF CERAMIC NPO |
| C 35 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 37 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-01330 | 1 | 51642 | 150-100-COG-331J | 330 PF CERAMIC NPO |
| C 41 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 43 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 44 | CC50-02270 | 1 | 51642 | 200-100-X7R-272K | .0027 UF CERAMIC X7R |
| C 45 | CC50-02270 | 1 | 51642 | 200-100-X7R-272K | .0027 UF CERAMIC X7R |
| C 46 | CC50-02270 | 1 | 51642 | 200-100-X7R-272K | .0027 UF CERAMIC X7R |
| C 47 | CC50-02270 | 1 | 51642 | 200-100-X7R-272K | .0027 UF CERAMIC X7R |
| C 48 | CC50-02270 | 1 | 51642 | 200-100-X7R-272K | .0027 UF CERAMIC X7R |
| CR 1 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 2 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 3 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 4 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 5 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 6 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 7 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 8 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 9 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 10 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 13 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 15 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 16 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 19 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| K 1 | SEP0-00101 | 1 | 95348 | 831A-4 | 5V DIP REED SWITCH |
| K 2 | SEP0-00101 | 1 | 95348 | 831A-4 | 5V DIP REED SWITCH |

### Parts List for 120BA15520 LEVEL DRIVER PCA Rev A (A10A1)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| K 3 | SEP0-00101 | 1 | 95348 | 831A-4 | 5V DIP REED SWITCH |
| K 4 | SEP0-00101 | 1 | 95348 | 831A-4 | 5V DIP REED SWITCH |
| K 5 | SEP0-00101 | 1 | 95348 | 831A-4 | 5V DIP REED SWITCH |
| L 1 | LAD0-04330 | 1 | 72259 | WEE-.33 | .33 UH INDUCTOR |
| L 2 | LAD0-04330 | 1 | 72259 | WEE-.33 | .33 UH INDUCTOR |
| L 3 | LAD0-04330 | 1 | 72259 | WEE-.33 | .33 UH INDUCTOR |
| L 4 | LAD0-04330 | 1 | 72259 | WEE-.33 | .33 UH INDUCTOR |
| L 5 | LAD0-04330 | 1 | 72259 | WEE-.33 | .33 UH INDUCTOR |
| L 6 | LAD0-07820 | 1 | 72259 | WEE-820 | 820uh INDUCTOR |
| L 7 | LAD0-07820 | 1 | 72259 | WEE-820 | 820uh INDUCTOR |
| L 8 | LAD0-07820 | 1 | 72259 | WEE-820 | 820uh INDUCTOR |
| L 9 | LAD0-07820 | 1 | 72259 | WEE-820 | 820uh INDUCTOR |
| L 10 | LAD0-07820 | 1 | 72259 | WEE-820 | 820uh INDUCTOR |
| P 3 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| P 4 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| P 5 | JIA2-20105 | 1 | 55322 | TSW-110-05-G-D | 20 PIN STRIPLINE PLUG |
| Q 1 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| R 1 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 2 | RAPD-15000 | 1 | 73138 | 89PR5K | 5K POT 15T PC MNT |
| R 3 | RN50-22000 | 1 | 65940 | CRB20FX2002 | 20.0K;M F;1/5W;1%;100PPM |
| R 4 | RAPD-11000 | 1 | 73138 | 89PR1K | 1K POT 15T PC MNT |
| R 5 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 6 | RN50-23320 | 1 | 65940 | CRB20FX3322 | 33.2K;M F;1/5W;1%;100PPM |
| R 7 | RAPD-11000 | 1 | 73138 | 89PR1K | 1K POT 15T PC MNT |
| R 8 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 9 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 10 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 11 | RAPD-15000 | 1 | 73138 | 89PR5K | 5K POT 15T PC MNT |
| R 12 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 13 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |
| R 14 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 15 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 16 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 17 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |
| R 18 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 19 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 20 | RAPD-11000 | 1 | 73138 | 89PR1K | 1K POT 15T PC MNT |
| R 21 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 22 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 23 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 24 | RN50-22000 | 1 | 65940 | CRB20FX2002 | 20.0K;M F;1/5W;1%;100PPM |
| R 25 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 26 | RN50-23320 | 1 | 65940 | CRB20FX3322 | 33.2K;M F;1/5W;1%;100PPM |
| R 27 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 28 | RAPD-15000 | 1 | 73138 | 89PR5K | 5K POT 15T PC MNT |
| R 29 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |
| R 30 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 32 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 33 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |
| R 34 | RAPD-11000 | 1 | 73138 | 89PR1K | 1K POT 15T PC MNT |
| R 35 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 36 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 37 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 38 | RAPD-15000 | 1 | 73138 | 89PR5K | 5K POT 15T PC MNT |
| R 39 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |
| R 40 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 42 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |

**Parts List for 120BA15520 LEVEL DRIVER PCA Rev A (A10A1)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 43 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |
| R 44 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 45 | RAPD-11000 | 1 | 73138 | 89PR1K | 1K POT 15T PC MNT |
| R 47 | RAPD-15000 | 1 | 73138 | 89PR5K | 5K POT 15T PC MNT |
| R 48 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 49 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 50 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 51 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |
| R 52 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 53 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 54 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 55 | RAPD-15000 | 1 | 73138 | 89PR5K | 5K POT 15T PC MNT |
| R 57 | RAPD-11000 | 1 | 73138 | 89PR1K | 1K POT 15T PC MNT |
| R 58 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 60 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 61 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| U 1 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 2 | UON0-00074 | 1 | 01295 | TL074CN | TL074CN QUAD FET OP AMP |
| U 3 | UON0-00844 | 1 | 24355 | AD844AN | AD844AN;OP AMP |
| U 4 | UON0-00844 | 1 | 24355 | AD844AN | AD844AN;OP AMP |
| U 5 | UON0-00844 | 1 | 24355 | AD844AN | AD844AN;OP AMP |
| U 6 | UON0-00844 | 1 | 24355 | AD844AN | AD844AN;OP AMP |
| U 7 | UON0-00844 | 1 | 24355 | AD844AN | AD844AN;OP AMP |
| U 8 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 9 | UON0-00844 | 1 | 24355 | AD844AN | AD844AN;OP AMP |
| U 11 | UON0-00844 | 1 | 24355 | AD844AN | AD844AN;OP AMP |
| U 13 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |

### Parts List for 120BA04601 POWER SUPPLY PCA Rev C (A11)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS04601 | Ref | 58900 | 120BS04601 | POWER SUPPLY SCH |
| 1 | 120BF04600 | 1 | 58900 | 120BF04600 | POWER SUPPLY PCB |
| 2 | HQH1-02200 | 1 | 13103 | 6073B | TO220 HEATSINK |
| 3 | ETST-06224 | 4 | 88245 | 1280B | TURRET TERMINAL |
| 4 | HQH0-02200 | 2 | 13103 | 6106B-16 | TO220 HEATSINK |
| 5 | HT00-00409 | 4 | 06383 | MS3367-4-9 | 4' WHITE CABLE TIE |
| 6 | ETSB-06224 | 9 | 88245 | 1309B | BIFURCATED TERMINAL 15/6 |
| 7 | HQIS-00050 | 1 | 55285 | 7403-09FR-33 | 4 LEAD TO5 INSULATOR |
| 101 | HBPP-44007 | 3 | 96906 | MS-51957-16 | 4-40 X 7/16 PAN |
| 102 | HNKS-44004 | 3 | 96906 | MS35649-*** | 4-40 KEP NUT |
| C 1 | CE16-08470 | 1 | 2M734 | ECEB1CU472 | 4700 UF 16V AXIAL LEAD |
| C 2 | CE16-08470 | 1 | 2M734 | ECEB1CU472 | 4700 UF 16V AXIAL LEAD |
| C 3 | CE35-08220 | 1 | 2M734 | ECEB1VU222 | 2200 UF 35V AXIAL LEAD |
| C 4 | CE35-08220 | 1 | 2M734 | ECEB1VU222 | 2200 UF 35V AXIAL LEAD |
| C 5 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 6 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 7 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 8 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 9 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 10 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 11 | CE63-07220 | 1 | 56289 | 501D227F063PR | 220 UF 63V ELECT. |
| C 12 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| CR 1 | DBMC-00001 | 1 | 26923 | CSB1 | 1 A DIP BRIDGE |
| CR 2 | DBMC-00001 | 1 | 26923 | CSB1 | 1 A DIP BRIDGE |
| CR 3 | DPAB-05391 | 1 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| CR 4 | DPAB-05391 | 1 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| CR 5 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| DS 1 | ILRR-00125 | 1 | 58361 | MV5077C | RED LED |
| P 1 | JIA1-02230 | 1 | 55322 | TSW-102-07-S-S | 2 PIN STRIPLINE PLUG |
| P 2 | JIA1-02230 | 1 | 55322 | TSW-102-07-S-S | 2 PIN STRIPLINE PLUG |
| Q 1 | QMPP-D4P05 | 1 | 95054 | SMU10P05 | SMU10P05 POWER FET |
| Q 2 | QMPP-D4P05 | 1 | 95054 | SMU10P05 | SMU10P05 POWER FET |
| Q 3 | QMPP-D4P05 | 1 | 95054 | SMU10P05 | SMU10P05 POWER FET |
| Q 4 | QMPP-D4P05 | 1 | 95054 | SMU10P05 | SMU10P05 POWER FET |
| Q 5 | QMPP-D4P05 | 1 | 95054 | SMU10P05 | SMU10P05 POWER FET |
| Q 6 | QMPP-D4P05. | 1 | 95054 | SMU10P05 | SMU10P05 POWER FET |
| R 1 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 2 | RN55-02210 | 1 | 81349 | RN55C2210F | 221 OHMS 1% MET FILM |
| R 3 | RN55-02210 | 1 | 81349 | RN55C2210F | 221 OHMS 1% MET FILM |
| R 4 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 5 | RN55-02430 | 1 | 81349 | RN55C2430F | 243 OHMS 1% MET FILM |
| R 6 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 7 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 8 | RAPG-11000 | 1 | 32997 | 3296Z-102 | 1K;10%;25T POT |
| R 9 | RAPG-11000 | 1 | 32997 | 3296Z-102 | 1K;10%;25T POT |
| R 10 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 11 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 12 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 13 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 14 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 15 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 16 | RN50-31500 | 1 | 81349 | RN50D150F | 150 K OHMS 1% METAL FILM |
| R 17 | RN50-27500 | 1 | 81349 | RN50D7502F | 75.0 K OHMS 1% MET FILM |

**Parts List for 120BA04601 POWER SUPPLY PCA Rev C (A11)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 18 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 19 | RN50-31500 | 1 | 81349 | RN50D150F | 150 K OHMS 1% METAL FILM |
| R 20 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 21 | RN50-03320 | 1 | 65940 | CRB20FX3320 | 332;M F;1/5W;1%;100PPM |
| RM 1 | RM7S-21000 | 1 | 71450 | 750-81-R10K | 10K OHM X 7 SIP NETWRK |
| S 1 | SPP0-00101 | 1 | 09353 | TP11-H8ABE | SPST PC MT PUSHBUTTON |
| U 1 | URC0-00317 | 1 | 27014 | LM317T | LM317C ADJ 3 TERM REG |
| U 2 | URC0-00317 | 1 | 27014 | LM317T | LM317C ADJ 3 TERM REG |
| U 3 | URC0-07815 | 1 | 04713 | MC7815CT | MC7815CT 1A 15V REG |
| U 4 | URG0-00317 | 1 | 27014 | LM317HVH | LM317HVH;ADJ;1A;TO-39 |
| U 5 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 6 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 7 | UIN0-01413 | 1 | 04713 | MC1413P | MC1413P X7 DRIVER .5A |
| U 8 | ULN0-00311 | 1 | 27014 | LM311N | LM311N COMPARATOR |

### Parts List for 120BA06900 100MHz REF PLL PCA Rev B (A14)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF06900 | 1 | 58900 | 120CF06900 | 100MHz REF PLL PCB |
| 2 | WJIB-05022 | 1 | 53387 | 923345-05 | .5' INSULATED JUMPER |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 8 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 9 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 11 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 12 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 13 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 14 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 15 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 16 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 17 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 18 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 21 | CC50-01470 | 1 | 51642 | 150-100-COG-471 | 470 PF CERAMIC NPO |
| C 22 | CC50-01470 | 1 | 51642 | 150-100-COG-471 | 470 PF CERAMIC NPO |
| C 23 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 24 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 27 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 29 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 31 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 32 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 33 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 34 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 35 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 36 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 37 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 38 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 40 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 41 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 42 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 43 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 44 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| CR 1 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 2 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 3 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 4 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 5 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 6 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 7 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CR 8 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CX 28 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| CX 30 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| DS 1 | ILRR-10125 | 1 | 28480 | HLMP-K101 | RED LED |
| GND 1 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| J 2 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| J 3 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |

### Parts List for 120BA06900 100MHz REF PLL PCA Rev B (A14)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| J 4 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| J 5 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| J 6 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| J 7 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| J 8 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| L 1 | LAD0-06220 | 1 | 72259 | WEE-22 | 22 UH INDUCTOR |
| L 2 | LAD0-08120 | 1 | 72259 | WEE-1200 | 1200 UH INDUCTOR |
| L 3 | LAD0-04680 | 1 | 72259 | WEE-.68 | .68 UH INDUCTOR |
| Q 1 | QBNS-04275 | 1 | 27014 | PN4275 | PN4275 .1A 15V .6W NPN |
| Q 2 | QBNS-03643 | 1 | 27014 | PN3643 | PN3643 .5A 30V .6W NPN |
| Q 3 | QBPS-02907 | 1 | 27014 | PN2907 | PN2907 .5A 40V .6W PNP |
| R 1 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 2 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 3 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 4 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 5 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 6 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 7 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 8 | RN55-04750 | 1 | 81349 | RN55C4750F | 475 OHMS 1% MET FILM |
| R 9 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 10 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 11 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 12 | RN55-24750 | 1 | 81349 | RN55C4752F | 47.5 K OHMS 1% MET FILM |
| R 13 | RN55-24750 | 1 | 81349 | RN55C4752F | 47.5 K OHMS 1% MET FILM |
| R 14 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 15 | RN55-32740 | 1 | 81349 | RN55C2743F | 274 K OHMS 1% MET FILM |
| R 16 | RN55-22000 | 1 | 81349 | RN55C2002F | 20 K OHMS 1% MET FILM |
| R 17 | RN55-22000 | 1 | 81349 | RN55C2002F | 20 K OHMS 1% MET FILM |
| R 18 | RN55-34990 | 1 | 81349 | RN55C4993F | 499 K OHMS 1% MET FILM |
| R 19 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 20 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 21 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 22 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 23 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 24 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 25 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 26 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 27 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 28 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 29 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 30 | RN55-32740 | 1 | 81349 | RN55C2743F | 274 K OHMS 1% MET FILM |
| R 31 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 32 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 33 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 34 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 35 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 36 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| TP 1 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| U 1 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 2 | UTN0-01252 | 1 | 04713 | MC74HC125N | MC74HC125N QUAD BUFFER |
| U 3 | URP0-78150 | 1 | 04713 | MC78L15CP | MC78L15 .1A 15V REG |
| U 4 | UEN0-10138 | 1 | 04713 | MC10138P | MC10138P BI-QUINARY CTR |
| U 5 | UEN0-12040 | 1 | 04713 | MC12040P | MC12040P PHASE/FREQ DET |
| U 6 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 7 | ULN0-00311 | 1 | 27014 | LM311N | LM311N COMPARATOR |
| U 8 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 9 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |

**Parts List for 120BA06900 100MHz REF PLL PCA Rev B (A14)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| U 10 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 11 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 12 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 13 | ULN0-00311 | 1 | 27014 | LM311N | LM311N COMPARATOR |
| U 14 | ULN0-00311 | 1 | 27014 | LM311N | LM311N COMPARATOR |

## Parts List for 120BA08800 1 Hz PLL PCA Rev H (A15)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF08800 | 1 | 58900 | 120CF08800 | 1 Hz PLL PCB |
| 2 | 101CF38200 | 1 | 58900 | 101CF38200 | 1 HZ BOTTOM SHIELD |
| 3 | 101CF38100 | 1 | 58900 | 101CF38100 | 1 HZ TOP SHIELD |
| 4 | 101BF38000 | 1 | 58900 | 101BF38000 | 1 HZ TOP SHIELD COVER |
| 5 | WJIB-02022 | 3 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| 101 | HBFP-25603 | 15 | 96906 | MS-24693-*** | 2-56 X 3/16 FLAT |
| 102 | HBFP-25607 | 15 | 58900 | HBFP-25607 | 2-56 X 7/16 FLAT |
| 103 | HQIP-00180 | 5 | 32559 | 121-032 | TO18 INSULATOR |
| C 1 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 2 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 3 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 4 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 5 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 6 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 7 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 10 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 11 | CC50-01470 | 1 | 51642 | 150-100-COG-471 | 470 PF CERAMIC NPO |
| C 12 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 13 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 14 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 15 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 16 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 17 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 18 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 19 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 20 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 21 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 22 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 23 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 24 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 25 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 26 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 27 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 28 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 29 | CC50-00680 | 1 | 51642 | 150-100-COG-680J | 68 PF CERAMIC NPO |
| C 30 | CC50-00047 | 1 | 51642 | 100-100-COG-479J | 4.7 PF CERAMIC NPO |
| C 31 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 32 | CC50-00390 | 1 | 51642 | 150-100-COG-390J | 39 PF CERAMIC NPO |
| C 33 | CE16-R7470 | 1 | 16508 | ECEAICU471 | 470 UF 16V RADIAL LEAD |
| C 34 | CE16-R7470 | 1 | 16508 | ECEAICU471 | 470 UF 16V RADIAL LEAD |
| C 35 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 36 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 37 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 38 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 39 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 40 | CC50-00680 | 1 | 51642 | 150-100-COG-680J | 68 PF CERAMIC NPO |
| C 41 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 42 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 43 | CC50-00047 | 1 | 51642 | 100-100-COG-479J | 4.7 PF CERAMIC NPO |
| C 44 | CC50-00390 | 1 | 51642 | 150-100-COG-390J | 39 PF CERAMIC NPO |
| C 45 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 46 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 47 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 48 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 49 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |

### Parts List for 120BA08800 1 Hz PLL PCA Rev H (A15)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 50 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 51 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 52 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 53 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 54 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 55 | CC50-00220 | 1 | 52763 | EDPT-22-NPO-5% | 22 PF CERAMIC NPO |
| C 56 | CC50-00220 | 1 | 52763 | EDPT-22-NPO-5% | 22 PF CERAMIC NPO |
| C 57 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 58 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 59 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 60 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 61 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 62 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 64 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 65 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 66 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 67 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 68 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 69 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| CR 1 | DVA0-00109 | 1 | 26629 | KV3901 | MV109 6-30 PF DIODE |
| CR 2 | DVA0-00109 | 1 | 26629 | KV3901 | MV109 6-30 PF DIODE |
| CR 3 | DVA0-00109 | 1 | 26629 | KV3901 | MV109 6-30 PF DIODE |
| CR 4 | DVA0-00109 | 1 | 26629 | KV3901 | MV109 6-30 PF DIODE |
| CR 6 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 7 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 8 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 9 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 11 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 12 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 13 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 14 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| DS 1 | ILRR-10125 | 1 | 28480 | HLMP-K101 | RED LED |
| GND 1 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| J 2 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| J 3 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| L 1 | LAD0-04100 | 1 | 72259 | WEE-.10 | .10UH INDUCTOR |
| L 2 | LAB0-03820 | 1 | 99800 | 1026-14 | .082 UH INDUCTOR |
| L 3 | LAD0-06220 | 1 | 72259 | WEE-22 | 22 UH INDUCTOR |
| L 4 | LAD0-06220 | 1 | 72259 | WEE-22 | 22 UH INDUCTOR |
| L 5 | LAD0-06220 | 1 | 72259 | WEE-22 | 22 UH INDUCTOR |
| L 6 | LAD0-06220 | 1 | 72259 | WEE-22 | 22 UH INDUCTOR |
| L 7 | LAB0-03820 | 1 | 99800 | 1026-14 | .082 UH INDUCTOR |
| L 8 | LAD0-04330 | 1 | 72259 | WEE-.33 | .33 UH INDUCTOR |
| L 9 | LAD0-04330 | 1 | 72259 | WEE-.33 | .33 UH INDUCTOR |
| L 10 | LAD0-05270 | 1 | 72259 | WEE-2.7 | 2.7 UH INDUCTOR |
| Q 1 | QBNS-06304 | 1 | 04713 | 2N6304 | 2N6304 15V 1400MHZ NPN |
| Q 2 | QBNS-06304 | 1 | 04713 | 2N6304 | 2N6304 15V 1400MHZ NPN |
| Q 3 | QBNS-06304 | 1 | 04713 | 2N6304 | 2N6304 15V 1400MHZ NPN |
| Q 4 | QBNS-06304 | 1 | 04713 | 2N6304 | 2N6304 15V 1400MHZ NPN |
| Q 5 | QBNS-06304 | 1 | 04713 | 2N6304 | 2N6304 15V 1400MHZ NPN |
| Q 6 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| R 1 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 2 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 3 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 4 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 5 | RN50-24990 | 1 | 65940 | CRB20FX4992 | 49.9K;M F;1/5W;1%;100PPM |

**Parts List for 120BA08800 1 Hz PLL PCA Rev H (A15)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 6 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 7 | RN50-24990 | 1 | 65940 | CRB20FX4992 | 49.9K;M F;1/5W;1%;100PPM |
| R 8 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 9 | RN50-26980 | 1 | 65940 | CRB20FX6982 | 69.8K;M F;1/5W;1%;100PPM |
| R 10 | RN50-26980 | 1 | 65940 | CRB20FX6982 | 69.8K;M F;1/5W;1%;100PPM |
| R 11 | RN50-22000 | 1 | 65940 | CRB20FX2002 | 20.0K;M F;1/5W;1%;100PPM |
| R 12 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 13 | RN50-24990 | 1 | 65940 | CRB20FX4992 | 49.9K;M F;1/5W;1%;100PPM |
| R 14 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 15 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 16 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 17 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 18 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 19 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 20 | RN50-01300 | 1 | 65940 | CRB20FX1300 | 130;;M F;1/5W;1%;100 PPM |
| R 21 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 22 | RN50-31500 | 1 | 81349 | RN50D150F | 150 K OHMS 1% METAL FILM |
| R 23 | RN50-23320 | 1 | 65940 | CRB20FX3322 | 33.2K;M F;1/5W;1%;100PPM |
| R 24 | RN50-23320 | 1 | 65940 | CRB20FX3322 | 33.2K;M F;1/5W;1%;100PPM |
| R 25 | RN50-23320 | 1 | 65940 | CRB20FX3322 | 33.2K;M F;1/5W;1%;100PPM |
| R 26 | RN50-23320 | 1 | 65940 | CRB20FX3322 | 33.2K;M F;1/5W;1%;100PPM |
| R 27 | RN50-22000 | 1 | 65940 | CRB20FX2002 | 20.0K;M F;1/5W;1%;100PPM |
| R 28 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 29 | RN50-00221 | 1 | 81349 | RN50D2211F | 22.1 OHM 1% METAL FILM |
| R 30 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 31 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 32 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 33 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 34 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 35 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 36 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 37 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 38 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 39 | RN50-03320 | 1 | 65940 | CRB20FX3320 | 332;M F;1/5W;1%;100PPM |
| R 40 | RN50-03320 | 1 | 65940 | CRB20FX3320 | 332;M F;1/5W;1%;100PPM |
| R 41 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 42 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 43 | RN50-16980 | 1 | 65940 | CRB20FX6981 | 6.98K;M F;1/5W;1%;100PPM |
| R 44 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 45 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 46 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 47 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 48 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 49 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 50 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 51 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 54 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 55 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 56 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 57 | RN50-13320 | 1 | 65940 | CRB20FX3321 | 3.32K;M F;1/5W;1%;100PPM |
| R 58 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 59 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 60 | RN50-01300 | 1 | 65940 | CRB20FX1300 | 130;;M F;1/5W;1%;100 PPM |
| R 61 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 62 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 63 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 64 | RN50-33320 | 1 | 65940 | CRB20FX3323 | 332K;M F;1/5W;1%;100PPM |

**Parts List for 120BA08800 1 Hz PLL PCA Rev H (A15)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 65 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 66 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 67 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 68 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 69 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 70 | RN50-00825 | 1 | 81349 | RN50D82R5F | 82.5 OHMS 1% METAL FILM |
| R 71 | RN50-00825 | 1 | 81349 | RN50D82R5F | 82.5 OHMS 1% METAL FILM |
| RX 52 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 53 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| TP 1 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| TP 2 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| U 1 | UCN0-51460 | 1 | 04713 | MC145146P | MC145146P FREQ SYNTH |
| U 2 | UIN0-08793 | 1 | 52648 | SP8793 | DIVIDE BY 40/41 |
| U 3 | UIN0-08793 | 1 | 52648 | SP8793 | DIVIDE BY 40/41 |
| U 4 | UTN0-03901 | 1 | 01295 | SN74LS390N | SN74LS390N DUAL COUNTER |
| U 5 | UCN0-51460 | 1 | 04713 | MC145146P | MC145146P FREQ SYNTH |
| U 6 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 7 | UIN0-08793 | 1 | 52648 | SP8793 | DIVIDE BY 40/41 |
| U 8 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 9 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 10 | UTN0-01252 | 1 | 04713 | MC74HC125N | MC74HC125N QUAD BUFFER |
| U 11 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 12 | UEN0-12040 | 1 | 04713 | MC12040P | MC12040P PHASE/FREQ DET |
| U 13 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 14 | UEN0-12013 | 1 | 04713 | MC12013P | MC12013 DIV 10/11 600MHZ |
| U 15 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 16 | UEN0-10231 | 1 | 04713 | MC10231P | MC10231P DUAL D F/F |
| U 17 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 18 | UTN0-00042 | 1 | 01295 | SN74HC04 | SN74HC04 HEX INVERTER |
| VR 1 | DZAD-04734 | 1 | 04713 | 1N4734A | IN4734 6.2V ZENER |

**Parts List for 120BA07000 REF/DC PLL PCA Rev E (A16)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS07000 | Ref | 58900 | 120BS07000 | REF/DC PLL SCH |
| 1 | 120CF07000 | 1 | 58900 | 120CF07000 | REF/DC PLL PCB |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-01100 | 1 | 51642 | 150-100-COG-101J | 100 PF CERAMIC NPO |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 6 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 8 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-02470 | 1 | 51642 | 200-100-W5R-472K | .0047 UF CERAMIC X7R |
| C 12 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 13 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 14 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 15 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 17 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 18 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 20 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 21 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 24 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 27 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 28 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 29 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 30 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 32 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 34 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 35 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 36 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 37 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 38 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 41 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 42 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 45 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 46 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 50 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 54 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 55 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 61 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 62 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 64 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 65 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 66 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 67 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 68 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 69 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 70 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 71 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

**Parts List for 120BA07000 REF/DC PLL PCA Rev E (A16)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| CR 1 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CR 2 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CR 3 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 4 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 5 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 6 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 8 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 9 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CR 10 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CR 11 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 12 | DSA0-00300 | 1 | 07263 | FDH300 | FDH300 LOW LEAK DIODE |
| CR 13 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 14 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 16 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| DS 1 | ILRR-10125 | 1 | 28480 | HLMP-K101 | RED LED |
| DS 2 | ILRR-10125 | 1 | 28480 | HLMP-K101 | RED LED |
| GND 1 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| J 2 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| J 3 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| J 4 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| J 5 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| L 1 | LAD0-08120 | 1 | 72259 | WEE-1200 | 1200 UH INDUCTOR |
| L 2 | LAD0-06100 | 1 | 72259 | WEE-10 | 10 UH INDUCTOR |
| Q 1 | QBPS-02907 | 1 | 27014 | PN2907 | PN2907 .5A 40V .6W PNP |
| Q 2 | QBPS-02907 | 1 | 27014 | PN2907 | PN2907 .5A 40V .6W PNP |
| R 2 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 3 | RN55-00562 | 1 | 81349 | RN55C56R2F | 56.2 OHMS 1% MET FILM |
| R 4 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 5 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 7 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 18 | RN55-23830 | 1 | 81349 | RN55C3832F | 38.3 K OHMS 1% MET FILM |
| R 19 | RN55-23830 | 1 | 81349 | RN55C3832F | 38.3 K OHMS 1% MET FILM |
| R 20 | RN55-17500 | 1 | 81349 | RN55C7501F | 7.5 K OHMS 1% MET FILM |
| R 21 | RN55-17500 | 1 | 81349 | RN55C7501F | 7.5 K OHMS 1% MET FILM |
| R 22 | RN55-23830 | 1 | 81349 | RN55C3832F | 38.3 K OHMS 1% MET FILM |
| R 23 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |
| R 24 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 25 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 27 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 28 | RN55-32000 | 1 | 81349 | RN55C2003F | 200 K OHMS 1% MET FILM |
| R 29 | RN55-32000 | 1 | 81349 | RN55C2003F | 200 K OHMS 1% MET FILM |
| R 30 | RN55-13920 | 1 | 81349 | RN55C3921F | 3.92 K OHMS 1% MET FILM |
| R 31 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 32 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 33 | RN55-15620 | 1 | 81349 | RN55C5621F | 5.62 K OHMS 1% MET FILM |
| R 34 | RN55-41000 | 1 | 81349 | RN55C1004F | 1 M OHMS 1% MET FILM |
| R 35 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 36 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 37 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 38 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 39 | RN55-17500 | 1 | 81349 | RN55C7501F | 7.5 K OHMS 1% MET FILM |
| R 40 | RN55-17500 | 1 | 81349 | RN55C7501F | 7.5 K OHMS 1% MET FILM |
| R 41 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 42 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 43 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 44 | RN55-03010 | 1 | 81349 | RN55C3010F | 301 OHMS 1% MET FILM |
| R 45 | RN55-03010 | 1 | 81349 | RN55C3010F | 301 OHMS 1% MET FILM |

**Parts List for 120BA07000 REF/DC PLL PCA Rev E (A16)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 46 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 52 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 55 | RN55-21780 | 1 | 81349 | RN55C1782F | 17.8 K OHMS 1% MET FILM |
| R 56 | RN55-21780 | 1 | 81349 | RN55C1782F | 17.8 K OHMS 1% MET FILM |
| R 57 | RN55-11820 | 1 | 81349 | RN55C1821F | 1.82 K OHMS 1% MET FILM |
| R 58 | RN55-11820 | 1 | 81349 | RN55C1821F | 1.82 K OHMS 1% MET FILM |
| R 59 | RN55-21780 | 1 | 81349 | RN55C1782F | 17.8 K OHMS 1% MET FILM |
| R 60 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |
| R 61 | RN55-11820 | 1 | 81349 | RN55C1821F | 1.82 K OHMS 1% MET FILM |
| R 62 | RN55-11820 | 1 | 81349 | RN55C1821F | 1.82 K OHMS 1% MET FILM |
| R 63 | RN55-29090 | 1 | 81349 | RN55C9092F | 90.9 K OHMS 1% MET FILM |
| R 64 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 65 | RN55-13920 | 1 | 81349 | RN55C3921F | 3.92 K OHMS 1% MET FILM |
| R 66 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 67 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 68 | RN55-15620 | 1 | 81349 | RN55C5621F | 5.62 K OHMS 1% MET FILM |
| R 69 | RN55-41000 | 1 | 81349 | RN55C1004F | 1 M OHMS 1% MET FILM |
| R 70 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 71 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 72 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 73 | RN55-31000 | 1 | 81349 | RN55C1003F | 100 K OHMS 1% MET FILM |
| R 74 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 75 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 76 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 77 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 78 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 79 | WJIB-05022 | 1 | 53387 | 923345-05 | .5' INSULATED JUMPER |
| R 80 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 81 | WJIB-05022 | 1 | 53387 | 923345-05 | .5' INSULATED JUMPER |
| R 82 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 83 | RN55-03010 | 1 | 81349 | RN55C3010F | 301 OHMS 1% MET FILM |
| RM 1 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| RM 2 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| RM 3 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| TP 1 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| TP 2 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| U 1 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 2 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 3 | UEN0-10131 | 1 | 04713 | MC10131P | MC10131P DUAL D F/F |
| U 4 | UEN0-10131 | 1 | 04713 | MC10131P | MC10131P DUAL D F/F |
| U 5 | UEN0-12040 | 1 | 04713 | MC12040P | MC12040P PHASE/FREQ DET |
| U 6 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 7 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 8 | ULN0-00311 | 1 | 27014 | LM311N | LM311N COMPARATOR |
| U 9 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 10 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 11 | UEN0-12040 | 1 | 04713 | MC12040P | MC12040P PHASE/FREQ DET |
| U 12 | UEN0-10131 | 1 | 04713 | MC10131P | MC10131P DUAL D F/F |
| U 13 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 14 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 15 | ULN0-00311 | 1 | 27014 | LM311N | LM311N COMPARATOR |
| U 16 | ULN0-00311 | 1 | 27014 | LM311N | LM311N COMPARATOR |
| U 17 | UTN0-01542 | 1 | 01295 | SN74HC154 | DECODERS/DEMULTIPLEXER |
| U 18 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 19 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 20 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 21 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |

**Parts List for 120BA07000 REF/DC PLL PCA Rev E (A16)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| U 22 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 23 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 24 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 25 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 26 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 27 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 28 | UTN0-01252 | 1 | 04713 | MC74HC125N | MC74HC125N QUAD BUFFER |
| U 29 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| VR 1 | DZAD-04734 | 1 | 04713 | 1N4734A | IN4734 6.2V ZENER |

## Parts List for 120BA07100 DIVIDE BY N PCA Rev H (A17)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS07100 | Ref | 58900 | 120BS07100 | DIVIDE BY N SCH |
| 1 | 120CF07100 | 1 | 58900 | 120CF07100 | DIVIDE BY N PCB |
| 2 | 304BF09200 | 2 | 58900 | 304BF09200 | PC BD SHIELD COVER |
| 3 | 304CF09100 | 1 | 58900 | 304CF09100 | TOP PC SHEILD 1.25 X 2.5 |
| 4 | 304CF09500 | 1 | 58900 | 304CF09500 | BOTTOM PC BD SHIELD 1.25 |
| 5 | HBCH-A3204 | 1 | 55566 | MIL STD | 10-32 X 1/4 CAP |
| 6 | JJF0-02000 | 1 | 22526 | 89F4578 | TWO CONTACT JUMPER |
| 7 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| 8 | HWSS-A0500 | 1 | 96906 | MS35338-138 | #10 X 3/16 SPLIT LOCK |
| 101 | HBFP-25606 | 10 | 96906 | MS-24693-*** | 2-56 X 3/8 FLAT |
| 102 | HBFP-25603 | 10 | 96906 | MS-24693-*** | 2-56 X 3/16 FLAT |
| AR 1 | MA23-00006 | 1 | 24539 | MSA-0835 | 0-6 GHZ +12.5DBM AMP |
| AR 2 | MA23-00006 | 1 | 24539 | MSA-0835 | 0-6 GHZ +12.5DBM AMP |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 6 | CC50-01510 | 1 | 51642 | 200-100-NPO-511J | 510 PF CERAMIC NPO |
| C 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 17 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 18 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 19 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 20 | CK50-03100 | 1 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| C 21 | CK50-03100 | 1 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| C 22 | CK50-00150 | 1 | 31433 | C0805C150J5GA3792 | 15 PF NPO CHIP |
| C 23 | CK50-03100 | 1 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| C 24 | CK50-03100 | 1 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| C 25 | CK50-00150 | 1 | 31433 | C0805C150J5GA3792 | 15 PF NPO CHIP |
| C 26 | CK50-03100 | 1 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| C 27 | CK50-03100 | 1 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| C 28 | CK50-03100 | 1 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| C 29 | CK50-03100 | 1 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| C 30 | CK50-03100 | 1 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| C 32 | CK50-03100 | 1 | 31433 | VJ08050A103KXAMB | .01 UF X7R CHIP |
| C 34 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 35 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 36 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 38 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 41 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 44 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 45 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 50 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 51 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 52 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 53 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 54 | CK50-00100 | 1 | 31433 | VJ0805A100JXAMB | 10 PF NPO CHIP |
| C 55 | CK50-00100 | 1 | 31433 | VJ0805A100JXAMB | 10 PF NPO CHIP |
| C 56 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

### Parts List for 120BA07100 DIVIDE BY N PCA Rev H (A17)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 57 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 58 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 59 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| CR 1 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CR 2 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CR 3 | DAA0-03401 | 1 | 04713 | MPN3401 | MPN3401 PIN DIODE |
| CR 4 | DAA0-03401 | 1 | 04713 | MPN3401 | MPN3401 PIN DIODE |
| CR 7 | DAA0-03401 | 1 | 04713 | MPN3401 | MPN3401 PIN DIODE |
| CR 8 | DAA0-03401 | 1 | 04713 | MPN3401 | MPN3401 PIN DIODE |
| J 2 | JRBM-00000 | 1 | 98291 | 51-045-0000 | SMB M BULK MOUNT |
| J 3 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| L 1 | LAB0-03220 | 1 | 99800 | 1026-00 | .022 UH INDUCTOR |
| L 2 | LAD0-06220 | 1 | 72259 | WEE-22 | 22 UH INDUCTOR |
| L 3 | LAB0-03330 | 1 | 99800 | 1026-04 | .033 UH INDUCTOR |
| Q 1 | QBPS-02907 | 1 | 27014 | PN2907 | PN2907 .5A 40V .6W PNP |
| R 1 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 6 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 7 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 10 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 11 | RN55-13920 | 1 | 81349 | RN55C3921F | 3.92 K OHMS 1% MET FILM |
| R 12 | RN55-34750 | 1 | 81349 | RN55C4753F | 475 K OHMS 1% MET FILM |
| R 13 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 14 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 15 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 16 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 17 | RN55-00825 | 1 | 81349 | RN55C82R5F | 82.5 OHMS 1% MET FILM |
| R 18 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 19 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 21 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 22 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 23 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 24 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 25 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 26 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 27 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 28 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 29 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 30 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 31 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 32 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 33 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 34 | RN55-04990 | 1 | 81349 | RN55C4990F | 499 OHMS 1% MET FILM |
| R 35 | RN55-04990 | 1 | 81349 | RN55C4990F | 499 OHMS 1% MET FILM |
| R 36 | RN55-04990 | 1 | 81349 | RN55C4990F | 499 OHMS 1% MET FILM |
| R 37 | RN55-04990 | 1 | 81349 | RN55C4990F | 499 OHMS 1% MET FILM |
| R 38 | RN55-04990 | 1 | 81349 | RN55C4990F | 499 OHMS 1% MET FILM |
| R 39 | RN55-04990 | 1 | 81349 | RN55C4990F | 499 OHMS 1% MET FILM |
| R 40 | RN55-04990 | 1 | 81349 | RN55C4990F | 499 OHMS 1% MET FILM |
| R 41 | RN55-04990 | 1 | 81349 | RN55C4990F | 499 OHMS 1% MET FILM |
| RM 1 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| RM 2 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| RM 3 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| RM 4 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| RM 5 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| RM 6 | RM7S-05600 | 1 | 71450 | 750-81-R560 | 560 OHM X 7 SIP NETWRK |
| U 1 | UEN0-10124 | 1 | 04713 | MC10124P | MC10124P QUAD TTL TO ECL |
| U 2 | UEN0-10124 | 1 | 04713 | MC10124P | MC10124P QUAD TTL TO ECL |

**Parts List for 120BA07100 DIVIDE BY N PCA Rev H (A17)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| U 3 | UEN0-10124 | 1 | 04713 | MC10124P | MC10124P QUAD TTL TO ECL |
| U 4 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 5 | UEN0-10136 | 1 | 04713 | MC10136P | MC10136P HEX COUNTER |
| U 6 | UEN0-10136 | 1 | 04713 | MC10136P | MC10136P HEX COUNTER |
| U 7 | UEN0-10131 | 1 | 04713 | MC10131P | MC10131P DUAL D F/F |
| U 8 | UEN0-10109 | 1 | 04713 | MC10109P | MC10109P DUAL OR/NOR |
| U 9 | UEN0-10131 | 1 | 04713 | MC10131P | MC10131P DUAL D F/F |
| U 10 | UEN0-10102 | 1 | 04713 | MC10102P | MC10102P QUAD NOR |
| U 11 | UEN0-12011 | 1 | 04713 | MC12011P | MC12011 DIV BY 8/9 600MH |
| U 12 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 13 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 14 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 15 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 16 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 17 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 18 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 19 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 20 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 21 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 22 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 23 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 24 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| W 1 | JIA1-02230 | 1 | 55322 | TSW-102-07-S-S | 2 PIN STRIPLINE PLUG |

### Parts List for 120BA07210 OUTPUT PLL PCA Rev B (A18)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS07210 | Ref | 58900 | 120BS07210 | OUTPUT PLL SCH |
| 1 | 120CF07210 | 1 | 58900 | 120CF07210 | OUTPUT PLL PCB |
| 2 | ETST-06224 | 5 | 88245 | 1280B | TURRET TERMINAL |
| C 1 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 2 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 3 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 8 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 10 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 12 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 15 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 17 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 18 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 24 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 27 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 28 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 32 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 33 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 34 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 35 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 42 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 43 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 44 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 45 | CC50-01150 | 1 | 51642 | 150-100-COG-151J | 150 PF CERAMIC NPO |
| C 46 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 47 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 48 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 49 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 50 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 51 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 52 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 53 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 54 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 55 | CC50-00100 | 1 | 51642 | 100-100-COG-100J | 10 PF CERAMIC NPO |
| C 56 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 57 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 58 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 59 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 60 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 61 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 62 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 63 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 64 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 65 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 66 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 67 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 68 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 69 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 70 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

### Parts List for 120BA07210 OUTPUT PLL PCA Rev B (A18)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 71 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 72 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 73 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 74 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 75 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 76 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 77 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 78 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 79 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 80 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 81 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 83 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 84 | CC50-04220 | 1 | 51642 | 1C20Z5U224M050B | .22 UF CERAMIC Z5U |
| C 85 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 86 | CC50-00100 | 1 | 51642 | 100-100-COG-100J | 10 PF CERAMIC NPO |
| C 87 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 88 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 89 | CC50-01330 | 1 | 51642 | 150-100-COG-331J | 330 PF CERAMIC NPO |
| C 90 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 91 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 92 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 93 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 94 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 95 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 96 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| CR 3 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CR 4 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CR 5 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 6 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CRX 1 | DSA0-02810 | Ref | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CRX 2 | DSA0-02810 | Ref | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| CX 13 | CC50-????? | 1 | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| CX 16 | CC50-????? | 1 | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| CX 21 | CC50-????? | 1 | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| DS 1 | ILRR-10125 | 1 | 28480 | HLMP-K101 | RED LED |
| J 2 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| J 3 | JRBM-00101 | 1 | 98291 | 51-053-0000 | SMB M RTANG PC MOUNT |
| K 1 | SEP0-00101 | 1 | 95348 | 831A-4 | 5V DIP REED SWITCH |
| K 2 | SEP0-00101 | 1 | 95348 | 831A-4 | 5V DIP REED SWITCH |
| K 3 | SEP0-00101 | 1 | 95348 | 831A-4 | 5V DIP REED SWITCH |
| L 1 | LAD0-08120 | 1 | 72259 | WEE-1200 | 1200 UH INDUCTOR |
| L 2 | LAD0-08120 | 1 | 72259 | WEE-1200 | 1200 UH INDUCTOR |
| L 3 | LAD0-06270 | 1 | 72259 | WEE-27 | 27 UH INDUCTOR |
| L 4 | LAD0-05470 | 1 | 72259 | WEE-4.7 | 4.7 UH INDUCTOR |
| L 5 | LAD0-07820 | 1 | 72259 | WEE-820 | 820uh INDUCTOR |
| L 6 | LAD0-07820 | 1 | 72259 | WEE-820 | 820uh INDUCTOR |
| L 7 | LAD0-07820 | 1 | 72259 | WEE-820 | 820uh INDUCTOR |
| R 1 | RN50-02740 | 1 | 65940 | CRB20FX2740 | 274;M F;1/5W;1%;100PPM |
| R 2 | RN50-05620 | 1 | 65940 | CRB20FX5620 | 562;M F;1/5W;1%;100PPM |
| R 3 | RN50-05620 | 1 | 65940 | CRB20FX5620 | 562;M F;1/5W;1%;100PPM |
| R 4 | RN50-01000 | 1 | 65940 | CRB20FX1000 | 100;M F;1/5W;1%;100PPM |
| R 5 | RN50-05620 | 1 | 65940 | CRB20FX5620 | 562;M F;1/5W;1%;100PPM |
| R 6 | RN50-05620 | 1 | 65940 | CRB20FX5620 | 562;M F;1/5W;1%;100PPM |
| R 7 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 10 | RN50-34990 | 1 | 65940 | CRB20FX4993 | 499K;M F;1/5W;1%;100PPM |
| R 11 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |
| R 12 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |

**Parts List for 120BA07210 OUTPUT PLL PCA Rev B (A18)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 13 | RN50-16810 | 1 | 81349 | RN50D6811F | 6.81 K OHMS 1% MET FILM |
| R 14 | RN50-05620 | 1 | 65940 | CRB20FX5620 | 562;M F;1/5W;1%;100PPM |
| R 15 | RN50-05620 | 1 | 65940 | CRB20FX5620 | 562;M F;1/5W;1%;100PPM |
| R 16 | RN50-34990 | 1 | 65940 | CRB20FX4993 | 499K;M F;1/5W;1%;100PPM |
| R 17 | RN50-34990 | 1 | 65940 | CRB20FX4993 | 499K;M F;1/5W;1%;100PPM |
| R 18 | RN50-23740 | 1 | 81349 | RN50D3742F | 37.4 K OHMS 1% MET FILM |
| R 19 | RN50-16810 | 1 | 81349 | RN50D6811F | 6.81 K OHMS 1% MET FILM |
| R 20 | RN50-23740 | 1 | 81349 | RN50D3742F | 37.4 K OHMS 1% MET FILM |
| R 21 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |
| R 23 | RN50-16810 | 1 | 81349 | RN50D6811F | 6.81 K OHMS 1% MET FILM |
| R 24 | RN50-34990 | 1 | 65940 | CRB20FX4993 | 499K;M F;1/5W;1%;100PPM |
| R 25 | RN50-23740 | 1 | 81349 | RN50D3742F | 37.4 K OHMS 1% MET FILM |
| R 26 | RN50-26980 | 1 | 65940 | CRB20FX6982 | 69.8K;M F;1/5W;1%;100PPM |
| R 27 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 28 | RN50-26980 | 1 | 65940 | CRB20FX6982 | 69.8K;M F;1/5W;1%;100PPM |
| R 29 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 30 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 31 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 33 | RAPG-11000 | 1 | 32997 | 3296Z-102 | 1K;10%;25T POT |
| R 34 | RAPG-11000 | 1 | 32997 | 3296Z-102 | 1K;10%;25T POT |
| R 35 | RAPG-11000 | 1 | 32997 | 3296Z-102 | 1K;10%;25T POT |
| R 39 | RN50-02210 | 1 | 81349 | RN50D2210F | 221 OHMS 1% METAL FILM |
| R 40 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 41 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 42 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 43 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 44 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 45 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 46 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 47 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 48 | RN50-01000 | 1 | 65940 | CRB20FX1000 | 100;M F;1/5W;1%;100PPM |
| R 49 | RN50-21500 | 1 | 81349 | RN50D1502F | 15.0 K OHMS 1% MET FILMM |
| R 50 | RN50-18250 | 1 | 81349 | RN50D8251F | 8.25 K OHMS 1% MET FILM |
| R 51 | RN50-13320 | 1 | 65940 | CRB20FX3321 | 3.32K;M F;1/5W;1%;100PPM |
| R 52 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 53 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 54 | RN50-11500 | 1 | 81349 | RN50D1501F | 1.50 K OHMS 1% MET FILM |
| R 55 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 56 | RN55-11820 | 1 | 81349 | RN55C1821F | 1.82 K OHMS 1% MET FILM |
| R 57 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 58 | RN50-14120 | 1 | 65940 | CRB20FX4121 | 4.12K;M F;1/5/1%/100PPM |
| R 59 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 60 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 61 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 62 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 63 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 64 | RN50-13320 | 1 | 65940 | CRB20FX3321 | 3.32K;M F;1/5W;1%;100PPM |
| R 65 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 66 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 67 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 68 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 69 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 70 | RN50-13320 | 1 | 65940 | CRB20FX3321 | 3.32K;M F;1/5W;1%;100PPM |
| R 71 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 72 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 73 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 74 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |

### Parts List for 120BA07210 OUTPUT PLL PCA Rev B (A18)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 75 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 76 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 77 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 78 | RN50-02740 | 1 | 65940 | CRB20FX2740 | 274;M F;1/5W;1%;100PPM |
| R 79 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 80 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 82 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 83 | RN50-21470 | 1 | 81349 | RN50D1472F | 14.7 K OHMS 1% MET FILM |
| R 84 | RN50-13320 | 1 | 65940 | CRB20FX3321 | 3.32K;M F;1/5W;1%;100PPM |
| R 85 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 86 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 87 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 88 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 89 | RN50-14750 | 1 | 81349 | RN50D4751F | 4.75 K OHMS 1% MET FILM |
| R 90 | RN50-14750 | 1 | 81349 | RN50D4751F | 4.75 K OHMS 1% MET FILM |
| R 91 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| RX 22 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 81 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| RX 92 | RN50-????? | Ref | 65940 | CRB20FX???? | SELECTED IN TEST |
| U 1 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 2 | UEN0-12040 | 1 | 04713 | MC12040P | MC12040P PHASE/FREQ DET |
| U 3 | UEN0-10138 | 1 | 04713 | MC10138P | MC10138P BI-QUINARY CTR |
| U 4 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 5 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 6 | ULN0-00311 | 1 | 27014 | LM311N | LM311N COMPARATOR |
| U 7 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 8 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 9 | UTN0-01252 | 1 | 04713 | MC74HC125N | MC74HC125N QUAD BUFFER |
| U 10 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 11 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 12 | UIN0-07868 | 1 | 24355 | AD7868AN | AD7868AN 12 BIT ADC/DAC |
| U 14 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 15 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 16 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 17 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 18 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 19 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 20 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 21 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 22 | UON0-00842 | 1 | 24355 | AD842 | OP AMP;80MHz GBP |
| U 23 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| W 1 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |

### Parts List for 120BA08300 YIG DRIVER PCA Rev J (A19)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS08300 | Ref | 58900 | 120BS08300 | YIG DRIVER SCH |
| 1 | 120CF08300 | 1 | 58900 | 120CF08300 | YIG DRIVER PCB |
| 2 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 3 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 8 | CT25-R6100 | 1 | 56289 | 199D106X9025CA1 | 10 UF 25V RADIAL LEAD |
| C 9 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 12 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 17 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 18 | CT25-R6100 | 1 | 56289 | 199D106X9025CA1 | 10 UF 25V RADIAL LEAD |
| C 19 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 20 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 23 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 24 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 25 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 26 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 27 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 28 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 29 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 30 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 31 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 32 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 33 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 34 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 35 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 36 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 37 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 38 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 39 | CT25-R6100 | 1 | 56289 | 199D106X9025CA1 | 10 UF 25V RADIAL LEAD |
| C 40 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 41 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 42 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 43 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 44 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 45 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 46 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 47 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 48 | CT25-R6100 | 1 | 56289 | 199D106X9025CA1 | 10 UF 25V RADIAL LEAD |
| C 49 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 50 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 51 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 52 | CE50-R6100 | 1 | 2M734 | ECEAIHU100 | 10 UF 50V RADIAL LEAD |
| C 53 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 54 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |

**Parts List for 120BA08300 YIG DRIVER PCA Rev J (A19)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 55 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 56 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 57 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 58 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 59 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 60 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 61 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 62 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 64 | CC50-01470 | 1 | 51642 | 150-100-COG-471 | 470 PF CERAMIC NPO |
| C 65 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 66 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 67 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 68 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 69 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 70 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 71 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 72 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| CR 1 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 2 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 3 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 4 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| Q 1 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| Q 2 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| Q 3 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| Q 4 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| Q 5 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| Q 6 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| Q 7 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| Q 8 | QBNS-02222 | 1 | 27014 | PN2222 | PN2222 .5A 30V NPN |
| R 1 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 2 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 3 | RN55-24020 | 1 | 81349 | RN55C4022F | 40.2 K OHMS 1% MET FILM |
| R 4 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 5 | RN55-23320 | 1 | 81349 | RN55C3322F | 33.2 K OHMS 1% MET FILM |
| R 6 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 7 | RN50-01000 | 1 | 65940 | CRB20FX1000 | 100;M F;1/5W;1%;100PPM |
| R 8 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 9 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 10 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 11 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 12 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 13 | RAPG-15000 | 1 | 32997 | 3296Z-1-502 | 5K 10% 25T .5W TRIM. POT |
| R 14 | RN55-24020 | 1 | 81349 | RN55C4022F | 40.2 K OHMS 1% MET FILM |
| R 15 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 16 | RN55-23320 | 1 | 81349 | RN55C3322F | 33.2 K OHMS 1% MET FILM |
| R 17 | RN55-21020 | 1 | 81349 | RN55C1022F | 10.2 K OHMS 1% MET FILM |
| R 18 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 19 | RN50-01000 | 1 | 65940 | CRB20FX1000 | 100;M F;1/5W;1%;100PPM |
| R 20 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 21 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 22 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 23 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 24 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 25 | RAPG-15000 | 1 | 32997 | 3296Z-1-502 | 5K 10% 25T .5W TRIM. POT |
| R 26 | RN55-22940 | 1 | 81349 | RN55C2942F | 29.4 K OHMS 1% MET FILM |
| R 27 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |

**Parts List for 120BA08300 YIG DRIVER PCA Rev J (A19)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 28 | RN55-21780 | 1 | 81349 | RN55C1782F | 17.8 K OHMS 1% MET FILM |
| R 29 | RN55-21400 | 1 | 81349 | RN55C1402F | 14 K OHMS 1% MET FILM |
| R 30 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 31 | RN50-01000 | 1 | 65940 | CRB20FX1000 | 100;M F;1/5W;1%;100PPM |
| R 32 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 33 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 34 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 35 | RAPG-15000 | 1 | 32997 | 3296Z-1-502 | 5K 10% 25T .5W TRIM. POT |
| R 36 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 37 | RAPG-15000 | 1 | 32997 | 3296Z-1-502 | 5K 10% 25T .5W TRIM. POT |
| R 38 | RN55-29090 | 1 | 81349 | RN55C9092F | 90.9 K OHMS 1% MET FILM |
| R 39 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 40 | RN55-22320 | 1 | 81349 | RN55C2322F | 23.2 K OHMS 1% MET FILM |
| R 41 | RN55-22550 | 1 | 81349 | RN55C2552F | 25.5 K OHMS 1% MET FILM |
| R 42 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 43 | RN50-01000 | 1 | 65940 | CRB20FX1000 | 100;M F;1/5W;1%;100PPM |
| R 44 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 45 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 46 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 47 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 48 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 49 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 50 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 51 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 52 | RN50-41000 | 1 | 65940 | CRB20FX1004 | 1.00M;M F;1/5W;1%;100PPM |
| R 53 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 54 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 55 | RN50-41000 | 1 | 65940 | CRB20FX1004 | 1.00M;M F;1/5W;1%;100PPM |
| R 56 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 57 | RN50-41000 | 1 | 65940 | CRB20FX1004 | 1.00M;M F;1/5W;1%;100PPM |
| R 58 | RN50-41000 | 1 | 65940 | CRB20FX1004 | 1.00M;M F;1/5W;1%;100PPM |
| R 59 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 60 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 61 | RN55-32320 | 1 | 81349 | RN55C2323F | 232 K OHMS 1% MET FILM |
| R 62 | RN55-23010 | 1 | 81349 | RN55C3012F | 30.1 K OHMS 1% MET FILM |
| R 63 | RN55-13920 | 1 | 81349 | RN55C3921F | 3.92 K OHMS 1% MET FILM |
| R 64 | RN55-14990 | 1 | 81349 | RN55C4991F | 4.99 K OHMS 1% MET FILM |
| R 65 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 66 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 67 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 68 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 69 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 70 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 71 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 72 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 73 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 74 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 75 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 76 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 77 | RN50-02000 | 1 | 65940 | CRB20FX2000 | 200;M F;1/5W;1%;100PPM |
| R 78 | RN50-01000 | 1 | 65940 | CRB20FX1000 | 100;M F;1/5W;1%;100PPM |
| R 79 | RN50-05620 | 1 | 65940 | CRB20FX5620 | 562;M F;1/5W;1%;100PPM |
| R 80 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 81 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 82 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 83 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| TC 1 | 120BA17105 | 1 | 58900 | 120BA17105 | TEMP COMP RES ASSY 750K |

### Parts List for 120BA08300 YIG DRIVER PCA Rev J (A19)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| TC 2 | 120BA17105 | 1 | 58900 | 120BA17105 | TEMP COMP RES ASSY 750K |
| TC 3 | 120BA17104 | 1 | 58900 | 120BA17104 | TEMP COMP RES ASSY 475K |
| TC 4 | 120BA17102 | 1 | 58900 | 120BA17102 | TEMP COMP RES ASSY 402K |
| U 1 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 2 | UTN0-01382 | 1 | 01295 | SN74HC138 | 74HC138 DECODER/DEMULTIP |
| U 3 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 4 | ULN0-05053 | 1 | 32293 | IH5053CJE | IH5053 QUAD ANALOG SWITC |
| U 5 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 6 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 7 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 8 | UVNP-00100 | 1 | 24355 | AD587JQ | AD587;10V REF |
| U 9 | UIN0-07547 | 1 | 24355 | AD7547KN | AD7547KN;DUAL 12 BIT DAC |
| U 10 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 11 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 12 | ULN0-05043 | 1 | 32293 | IH5043CPE | IH5043CPA DUAL SPDT SW |
| U 13 | UON0-00708 | 1 | 24355 | AD708JN | AD708JN;DUAL OP AMP |
| U 14 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 15 | ULN0-02901 | 1 | 27014 | LM2901N | LM2901N QUAD COMPARATOR |
| U 16 | UVNP-00100 | 1 | 24355 | AD587JQ | AD587;10V REF |
| U 17 | UTN0-00862 | 1 | 01295 | 74HC86N | QUAD 2 INPUT X OR GATE |
| U 18 | UTN0-01232 | 1 | 01295 | SN74HC123 | RETRIG. MULTIVIBRATOR |
| U 19 | UTN0-00742 | 1 | 18714 | 74HC74E | DUAL D FLIP-FLOPS |
| U 20 | UTN0-00862 | 1 | 01295 | 74HC86N | QUAD 2 INPUT X OR GATE |
| U 21 | UTN0-02732 | 1 | 01295 | 74HC273 | 74HC273;OCTAL D-TYPE F-F |
| U 22 | UTN0-00322 | 1 | 18714 | 74HC32E | QUAD 2 INPUT OR GATE |
| U 23 | UTN0-00322 | 1 | 18714 | 74HC32E | QUAD 2 INPUT OR GATE |
| U 24 | UTN0-01232 | 1 | 01295 | SN74HC123 | RETRIG. MULTIVIBRATOR |
| U 25 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 26 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 27 | UON0-00072 | 1 | 01295 | TL072CP | TL072CP DUAL FET OP AMP |
| U 28 | UTN0-00322 | 1 | 18714 | 74HC32E | QUAD 2 INPUT OR GATE |
| U 29 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |
| U 30 | UON0-05532 | 1 | 18324 | NE5532N | DUAL;OP AMP;10MHz |

**Parts List for 120BA01401 DISPLAY DRIVER PCA Rev D (A20)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS01401 | Ref | 58900 | 120BS01401 | DISPLAY DRIVER SCH |
| 1 | 120DF01400 | 1 | 58900 | 120DF01400 | DISPLAY DRIVER PCB |
| 2 | HQH1-02200 | 1 | 13103 | 6073B | TO220 HEATSINK |
| 101 | HBPP-44006 | 1 | 96906 | MS-51957-15 | 4-40 X 3/8 PAN |
| 102 | HWFN-40400 | 1 | 96906 | FW-4032 | #4 X 1/4 NYLON WASHER |
| 103 | HNSS-44004 | 1 | 96906 | MS35649-244 | 4-40 HEX NUT |
| 104 | HQWC-01260 | 1 | 04713 | B52200F006 | TO126 DOME WASHER |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 6 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 7 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 8 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 9 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 10 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 13 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 17 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 18 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 24 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 25 | CE16-R7470 | 1 | 16508 | ECEAICU471 | 470 UF 16V RADIAL LEAD |
| C 26 | CE16-R7470 | 1 | 16508 | ECEAICU471 | 470 UF 16V RADIAL LEAD |
| C 27 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 28 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 29 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 30 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| L 1 | LR00-08100 | 1 | 99800 | 3443-72 | 1mH INDUCTOR |
| P 1 | JIA1-05295 | 1 | 27264 | 22-11-2052 | 5 PIN LOCKING STRIP PLUG |
| P 2 | JIR1-10260 | 1 | 27264 | 22-12-2104 | 10 PIN LOCKING STRIP PLG |
| P 5 | JIA2-26460 | 1 | 52072 | CA-D26-23B-46 | 26 PIN STRIPLINE PLUG |
| P 9 | JIR1-20034 | 1 | 09922 | 09922 | 34 PIN STRPLN PLG RT ANG |
| P 11 | JIR1-20034 | 1 | 09922 | 09922 | 34 PIN STRPLN PLG RT ANG |
| P 34 | JIA2-34460 | 1 | 52072 | CA-D34-23B-46 | 34 PIN STRIPLINE PLUG |
| P 60 | JIR1-20060 | 1 | 09922 | 65626-11-60 | 60 PIN STRPLN PLG RT ANG |
| R 1 | RN55-23010 | 1 | 81349 | RN55C3012F | 30.1 K OHMS 1% MET FILM |
| R 2 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 3 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 4 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 5 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 6 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 7 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 8 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 9 | WJIB-02022 | 1 | 53387 | 923345-02 | .2' INSULATED JUMPER |
| R 10 | WJIB-05022 | 1 | 53387 | 923345-05 | .5' INSULATED JUMPER |
| R 11 | RN55-00150 | 1 | 81349 | RN55C15R0F | 15 OHMS 1% MET FILM |
| R 12 | RN55-00562 | 1 | 81349 | RN55C56R2F | 56.2 OHMS 1% MET FILM |

**Parts List for 120BA01401 DISPLAY DRIVER PCA Rev D (A20)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 13 | WJIB-05022 | 1 | 53387 | 923345-05 | .5' INSULATED JUMPER |
| U 1 | UTN0-01322 | 1 | 01295 | SN74HC132N | SN74HC132N 4X SCHMIDT NA |
| U 2 | UTN0-01971 | 1 | 01295 | SN74LS197 | 74LS197 PRESETTABLE DECA |
| U 3 | UMN0-02128 | 1 | 0D2A6 | M58725P | TMM2016 2K X 8 RAM |
| U 4 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 5 | UTN0-45142 | 1 | 01295 | SN74HC4514NT | 74HC4514 DECODERS/DEMULT |
| U 6 | UMN0-02128 | 1 | 0D2A6 | M58725P | TMM2016 2K X 8 RAM |
| U 7 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 8 | UTN0-45142 | 1 | 01295 | SN74HC4514NT | 74HC4514 DECODERS/DEMULT |
| U 9 | UIN0-00594 | 1 | 18324 | NE594N | NE594 8X DISP DRIVE |
| U 10 | UIN0-00594 | 1 | 18324 | NE594N | NE594 8X DISP DRIVE |
| U 11 | UIN0-00594 | 1 | 18324 | NE594N | NE594 8X DISP DRIVE |
| U 12 | UIN0-00594 | 1 | 18324 | NE594N | NE594 8X DISP DRIVE |
| U 13 | UMN0-02128 | 1 | 0D2A6 | M58725P | TMM2016 2K X 8 RAM |
| U 14 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 15 | UTN0-45142 | 1 | 01295 | SN74HC4514NT | 74HC4514 DECODERS/DEMULT |
| U 16 | UMN0-02128 | 1 | 0D2A6 | M58725P | TMM2016 2K X 8 RAM |
| U 17 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 18 | UTN0-45142 | 1 | 01295 | SN74HC4514NT | 74HC4514 DECODERS/DEMULT |
| U 19 | UIN0-00594 | 1 | 18324 | NE594N | NE594 8X DISP DRIVE |
| U 20 | UIN0-00594 | 1 | 18324 | NE594N | NE594 8X DISP DRIVE |
| U 21 | UIN0-00594 | 1 | 18324 | NE594N | NE594 8X DISP DRIVE |
| U 22 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 23 | UTN0-02442 | 1 | 04713 | MC74HC244N | 74HC244 8X DRIV/RECV |
| U 24 | URC0-07805 | 1 | 04713 | MC7805CT | MC7805CT 1A 5V REG |

### Parts List for 101BA39101 HI STAB OSC PCA Rev B (A21)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 101BS39101 | Ref | 58900 | 101BS39101 | HI STAB OSC |
| 1 | 101BF39101 | 1 | 58900 | 101BF39101 | HI STAB OSC PCB |
| C 1 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 2 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 3 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| R 1 | RAPD-31000 | 1 | 73138 | 89PR100K | 100K POT 15T PC MNT |
| Y 1 | OXO0-00010 | 1 | | 250-0578 | 10MHz OVEN XTAL OSC |

### Parts List for 120BA01000 COMPUTER BUS PCA Rev E (A100)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF01000 | 1 | 58900 | 120CF01000 | COMPUTER BUS PCB |
| 2 | JPS0-20036 | 20 | 01295 | H421121-36 | 72 PIN PC EDGE CONN |
| 3 | JIA2-60460 | 1 | 52072 | CA-D60-23B-46 | 60 PIN STRIPLINE PLUG |
| 4 | JIA2-50460 | 1 | 52072 | CA-D50-23B-46 | 50 PIN STRIPLINE PLUG |
| 5 | JIA2-26460 | 1 | 52072 | CA-D26-23B-46 | 26 PIN STRIPLINE PLUG |
| 6 | JSP0-10014 | 1 | 09922 | DILB14P-108 | 14 PIN DIP SOCKET |
| 7 | ETSB-06216 | 130 | 88245 | 2000B | BIFURCATED TERMINAL 5/32 |
| 8 | WSB0-26000 | 2 | 70903 | 8023/100 | 26 GA BUS WIRE |
| L 1 | LAD0-06330 | 1 | 72259 | 90537-31 | 33 UH INDUCTOR |
| L 2 | LAD0-06330 | 1 | 72259 | 90537-31 | 33 UH INDUCTOR |
| L 3 | LAD0-06330 | 1 | 72259 | 90537-31 | 33 UH INDUCTOR |
| L 4 | LAD0-06330 | 1 | 72259 | 90537-31 | 33 UH INDUCTOR |

### Parts List for 120BA07300 I/O BUSS PCA Rev F (A101)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF07300 | 1 | 58900 | 120CF07300 | I/O BUSS PCB |
| 2 | JPS0-20050 | 9 | 31781 | 345-100-524-201 | 100 PIN PC EDGE CONN |
| 3 | JIA2-60460 | 1 | 52072 | CA-D60-23B-46 | 60 PIN STRIPLINE PLUG |
| 4 | ETSB-06216 | 148 | 88245 | 2000B | BIFURCATED TERMINAL 5/32 |

### Parts List for 120CA04200 CAPACITOR ASSY Rev B (A102)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF04200 | 1 | 58900 | 120CF04200 | CAPACITOR PCB |
| 2 | HLST-A1211 | 9 | 79963 | 627-.196 | #10 SOLDER LUG |
| 6 | WSB0-20000 | 1 | 70903 | 8020/100 | 20 GA BUS WIRE |
| 7 | WTT0-20000 | 1 | 29005 | #20 TFE TW | #20 CLEAR TFE SLVNG |
| 101 | HBPP-A3206 | 10 | 96906 | MIL STD | 10-32 X 3/8 PAN |
| 102 | HWSS-A0500 | 10 | 96906 | MS35338-138 | #10 X 3/16 SPLIT LOCK |
| 103 | HWFS-A0700 | 10 | 96906 | MS15795-808 | #10 X 7/16 FLAT WASHER |
| C 1 | CE15-09650 | 1 | 65517 | EMC-653-CH-15-S | 65000 UF 15V ELECT. |
| C 2 | CE15-09650 | 1 | 65517 | EMC-653-CH-15-S | 65000 UF 15V ELECT. |
| C 3 | CE35-09250 | 1 | 65517 | EMC-253-AH-35-S | 25000 UF 35V ELECT. |
| C 4 | CE35-09250 | 1 | 65517 | EMC-253-AH-35-S | 25000 UF 35V ELECT. |
| C 5 | CE35-09250 | 1 | 65517 | EMC-253-AH-35-S | 25000 UF 35V ELECT. |

### Parts List for 120BA05500 11 DIGIT DISPLAY PCA Rev C1 (A103)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF05500 | 1 | 58900 | 120CF05500 | 11 DIGIT DISPLAY PCB |
| 2 | HSTS-44005 | 1 | 55566 | 3048-B-440-A-0 | 5/16 ROUND SWAGE SPACER |
| 3 | HSTX-44004 | 2 | 88245 | A1591B | 4-40 CORNR BLOCK 1/16 MT |
| 4 | GFU0-00003 | 11 | 26066 | 4108 | FOAM TAPE .25W X .125THK |
| 5 | GFU0-00201 | 16 | 26066 | 4516 | 1/8 X 1/16 FOAM TAPE |
| DS 1 | IMF0-00110 | 1 | 0HFH6 | 11-LT-02-Z | 11 DIGIT DISPLAY |
| P 11 | JIA2-34460 | 1 | 52072 | CA-D34-23B-46 | 34 PIN STRIPLINE PLUG |

### Parts List for 120BA05600 5 & 9 DIGIT DISPLAY PCA Rev C1 (A104)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120CF05600 | 1 | 58900 | 120CF05600 | 5 & 9 DIGIT DISPLAY PCB |
| 2 | HSTS-44005 | 2 | 55566 | 3048-B-440-A-0 | 5/16 ROUND SWAGE SPACER |
| 3 | HSTX-44004 | 3 | 88245 | A1591B | 4-40 CORNR BLOCK 1/16 MT |
| 4 | GFU0-00003 | 20 | 26066 | 4108 | FOAM TAPE .25W X .125THK |
| 5 | GFU0-00201 | 28 | 26066 | 4516 | 1/8 X 1/16 FOAM TAPE |
| DS 1 | IMF0-00050 | 1 | 0HFH6 | 5LT-03 | 5 DIGIT FLUOR DISPLAY |
| DS 2 | IMF0-00090 | 1 | 0HFH6 | 9LT-03 | 9 DIGIT FLUOR DISPLAY |
| P 5 | JIA2-26460 | 1 | 52072 | CA-D26-23B-46 | 26 PIN STRIPLINE PLUG |
| P 9 | JIA2-34460 | 1 | 52072 | CA-D34-23B-46 | 34 PIN STRIPLINE PLUG |

### Parts List for 120BA04801 PUSHBUTTON BD M7200 PCA Rev C (A105)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS04801 | Ref | 58900 | 120BS04801 | PUSHBUTTON BD SCH M7200 |
| 1 | 120CF04800 | 1 | 58900 | 120CF04800 | PUSHBUTTON BD PCB |
| 2 | SPPL-K0102 | 1 | 04426 | 80-390102 | LT GRY KEYCAP W/LIGHT |
| 3 | SPPL-K0110 | 14 | 04426 | 80-390110 | .25 LT GRY KEYCAP W/LITE |
| 4 | SPPL-K0112 | 1 | 04426 | 80-390112 | .25 LT GRY KEYCAP W/O LT |
| 5 | HWFN-80401 | 15 | 32559 | 912 .090H | #8 X 1/4 NYLON WASHER |
| 6 | SPPL-L0100 | 15 | 04426 | 80-390100 | LIGHT PIPE |
| DS 1 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 2 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| P 34 | JIR1-20034 | 1 | 09922 | 09922 | 34 PIN STRPLN PLG RT ANG |
| S 1 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 2 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 3 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 5 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 6 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 7 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 8 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 9 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 10 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 11 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 12 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 13 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 15 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 16 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 17 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 18 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |

### Parts List for **120BA01511** **DATA ENTRY M7300 PCA** **Rev B** **(A106)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS01511 | Ref | 58900 | 120BS01511 | DATA ENTRY M7300 SCH |
| 1 | 120CF01500 | 1 | 58900 | 120CF01500 | DATA ENTRY PCB |
| 2 | SPPL-K0112 | 7 | 04426 | 80-390112 | .25 LT GRY KEYCAP W/O LT |
| 3 | SPPL-K0110 | 2 | 04426 | 80-390110 | .25 LT GRY KEYCAP W/LITE |
| 4 | 120BF05800 | 1 | 58900 | 120BF05800 | PROGRAM KEY CAP |
| 5 | SPPL-K9025 | 3 | 04426 | 80-399025 | .47 RECT LT GRY KEYCAP |
| 6 | 120BF05900 | 2 | 58900 | 120BF05900 | ARROW KEY CAP |
| 7 | 120BF05700 | 1 | 58900 | 120BF05700 | SHIFT KEY CAP |
| 8 | 120BF06000 | 1 | 58900 | 120BF06000 | KEY PAD '0' |
| 9 | 120BF06001 | 1 | 58900 | 120BF06001 | KEY PAD '1' |
| 10 | 120BF06002 | 1 | 58900 | 120BF06002 | KEY PAD '2' |
| 11 | 120BF06003 | 1 | 58900 | 120BF06003 | KEY PAD '3' |
| 12 | 120BF06004 | 1 | 58900 | 120BF06004 | KEY PAD '4' |
| 13 | 120BF06005 | 1 | 58900 | 120BF06005 | KEY PAD '5' |
| 14 | 120BF06006 | 1 | 58900 | 120BF06006 | KEY PAD '6' |
| 15 | 120BF06007 | 1 | 58900 | 120BF06007 | KEY PAD '7' |
| 16 | 120BF06008 | 1 | 58900 | 120BF06008 | KEY PAD '8' |
| 17 | 120BF06009 | 1 | 58900 | 120BF06009 | KEY PAD '9' |
| 18 | 120BF06010 | 1 | 58900 | 120BF06010 | KEY PAD DECIMAL POINT |
| 19 | 120BF06011 | 1 | 58900 | 120BF06011 | KEY PAD MINUS & BACKSPAC |
| 20 | SPPL-K0106 | 4 | 04426 | 80-390106 | LT GRY KEYCAP W/O LIGHT |
| 21 | SPPL-K9026 | 1 | 04426 | 80-399026 | .47 RECT DK GRY KEYCAP |
| 22 | HWFN-80401 | 9 | 32559 | 912 .090H | #8 X 1/4 NYLON WASHER |
| 23 | SPPL-L0100 | 2 | 04426 | 80-390100 | LIGHT PIPE |
| C 1 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 2 | CC50-03680 | 1 | 51642 | 150-100-W5R-683 | .068 UF CERAMIC X7R |
| C 3 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 4 | CC50-03680 | 1 | 51642 | 150-100-W5R-683 | .068 UF CERAMIC X7R |
| C 5 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 6 | CC50-03680 | 1 | 51642 | 150-100-W5R-683 | .068 UF CERAMIC X7R |
| C 7 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 8 | CC50-03680 | 1 | 51642 | 150-100-W5R-683 | .068 UF CERAMIC X7R |
| DS 1 | IML0-00080 | 1 | 28480 | HDSP-2113 | 8 DIGIT GREEN LED |
| DS 2 | IML0-00080 | 1 | 28480 | HDSP-2113 | 8 DIGIT GREEN LED |
| DS 3 | IML0-00080 | 1 | 28480 | HDSP-2113 | 8 DIGIT GREEN LED |
| DS 4 | IML0-00080 | 1 | 28480 | HDSP-2113 | 8 DIGIT GREEN LED |
| DS 5 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 6 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 7 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 8 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 9 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 10 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 11 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 12 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 13 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 14 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 15 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 16 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 17 | ILGR-01540 | 1 | 28480 | HLMP-1540 | CLEAR GREEN LED |
| DS 18 | ILYR-01440 | 1 | 28480 | HLMP-1440 | CLEAR YELLOW LED |
| P 2 | JIA1-04295 | 1 | 27264 | 22-11-2042 | 4 PIN LOCKING STRIP PLUG |
| P 60 | JIR1-20060 | 1 | 09922 | 65626-11-60 | 60 PIN STRPLN PLG RT ANG |
| R 1 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| S 1 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 2 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 3 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 4 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |

**Parts List for 120BA01511 DATA ENTRY M7300 PCA Rev B (A106)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| S 5 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 6 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 7 | 120BA06700 | 1 | 58900 | 120BA06700 | PUSHBUTTON SW MOM/LED AS |
| S 8 | 120BA06711 | 1 | 58900 | 120BA06711 | PUSHBUTTON SW ASY MNT |
| S 11 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 12 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 13 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 14 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 15 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 16 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 17 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 18 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 19 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 20 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 21 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 22 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 23 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 24 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 25 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 26 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 27 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 28 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 29 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 30 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 31 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 32 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 33 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 34 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| S 35 | 120BA06701 | 1 | 58900 | 120BA06701 | PUSHBUTTON SW ASY |
| XDS 1 | JSE0-20028 | 1 | 51167 | 28-8675-610-C | 28 PIN ELEVATOR SOCKET |
| XDS 2 | JSE0-20028 | 1 | 51167 | 28-8675-610-C | 28 PIN ELEVATOR SOCKET |
| XDS 3 | JSE0-20028 | 1 | 51167 | 28-8675-610-C | 28 PIN ELEVATOR SOCKET |
| XDS 4 | JSE0-20028 | 1 | 51167 | 28-8675-610-C | 28 PIN ELEVATOR SOCKET |

**Parts List for 120BA12900 MAIN TUNE PCA Rev A1 (A107)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 120BF12900 | 1 | 58900 | 120BF12900 | MAIN TUNE PCB |
| 2 | ETSB-06216 | 22 | 88245 | 2000B | BIFURCATED TERMINAL 5/32 |
| 3 | HSCS-40304 | 2 | 06540 | 9532B-A-115 | #4 X 3/16 SWG CLR SPACER |
| C 1 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 2 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 3 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 4 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| CR 1 | DPAB-05391 | 1 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| CR 2 | DPAB-05391 | 1 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| CR 3 | DPAB-05391 | 1 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| CR 4 | DPAB-05391 | 1 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| CR 5 | DPAB-05391 | 1 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| CR 6 | DPAB-05391 | 1 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| CR 7 | DPAB-05391 | 1 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| CR 8 | DPAB-05391 | 1 | 04713 | 1N5391 | 1N5391 1.5A 35V DIODE |
| R 1 | RN55-04750 | 1 | 81349 | RN55C4750F | 475 OHMS 1% MET FILM |
| R 2 | RN55-04750 | 1 | 81349 | RN55C4750F | 475 OHMS 1% MET FILM |
| R 3 | RN55-04750 | 1 | 81349 | RN55C4750F | 475 OHMS 1% MET FILM |
| R 4 | RN55-04750 | 1 | 81349 | RN55C4750F | 475 OHMS 1% MET FILM |

**Parts List for 420BA13610 40GHz DRIVER PCA;M7XXX Rev A (A108)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 420BS13610 | Ref | 58900 | 420BS13610 | 40 GHz DRIVER SCH;M7XXX |
| 1 | 420BF13610 | 1 | 58900 | 420BF13610 | 40 GHz DRIVER PCB;M7XXX |
| 2 | ETSB-06216 | 4 | 88245 | 2000B | BIFURCATED TERMINAL 5/32 |
| C 1 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| P 1 | JIR1-10260 | 1 | 27264 | 22-12-2104 | 10 PIN LOCKING STRIP PLG |
| R 1 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |
| R 2 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |
| R 3 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |
| R 4 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |

**Parts List for 105BA02502 5 MHZ EXT CLOCK PCA Rev A (A115)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 105BS02502 | Ref | 58900 | 105BS02502 | 5 MHZ EXT CLOCK SCHEM |
| 2 | 105BF02500 | 1 | 58900 | 105BF02500 | 5 MHZ EXT CLOCK PCB |
| 3 | HSTS-40404 | 3 | 06540 | 9533B-A-0440 | 4-40 X 1/4 SWAGE SPACER |
| 4 | WRTE-269XX | 4 | 92194 | 2843-9 | #26 SOLID TEFLON |
| C 1 | CT10-06390 | 1 | 56289 | 150D396X9010B2 | 39 UF 10V TANTALUM |
| C 2 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 3 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 4 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 5 | CC50-01470 | 1 | 51642 | 150-100-COG-471 | 470 PF CERAMIC NPO |
| CR 1 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| CR 2 | DSA0-04148 | 1 | 07263 | 1N4148 | 1N4148 G.P. DIODE |
| Q 1 | QBNS-04275 | 1 | 27014 | PN4275 | PN4275 .1A 15V .6W NPN |
| Q 2 | QBNS-04275 | 1 | 27014 | PN4275 | PN4275 .1A 15V .6W NPN |
| R 1 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 2 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 3 | RN55-04750 | 1 | 81349 | RN55C4750F | 475 OHMS 1% MET FILM |
| R 4 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 5 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 6 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 7 | RN55-04750 | 1 | 81349 | RN55C4750F | 475 OHMS 1% MET FILM |
| R 8 | RN50-00200 | 1 | 65940 | CRB20FX20R0 | 20.0;M F;1/5W;1%;100PPM |
| U 1 | UTN0-00862 | 1 | 01295 | 74HC86N | QUAD 2 INPUT X OR GATE |
| U 2 | UTN0-01572 | 1 | 01295 | 74HC157N | 74HC157;QUAD DATA SELECT |

### Parts List for 120BA07900 DETECTOR BUFFER PCA Rev D (A200)

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 0 | 120BS07900 | Ref | 58900 | 120BS07900 | DETECTOR BUFFER SCH |
| 1 | 120CF07900 | 1 | 58900 | 120CF07900 | DETECTOR BUFFER PCB |
| 2 | 120CF08500 | 1 | 58900 | 120CF08500 | DETECTOR BUFFER HOUSING |
| 3 | 120BF08600 | 1 | 58900 | 120BF08600 | DETECTOR BUFFER COVER |
| 4 | 120BF08700 | 1 | 58900 | 120BF08700 | DETECTOR BUFFER BASE |
| 5 | ETSB-06216 | 14 | 88245 | 2000B | BIFURCATED TERMINAL 5/32 |
| 6 | HSFH-60204 | 2 | 07556 | 4728-S-5 | 6-32x1/8 M/M HEX SPACER |
| 7 | ETST-06224 | 1 | 88245 | 1280B | TURRET TERMINAL |
| 8 | WSB0-26000 | 20 | 70903 | 8023/100 | 26 GA BUS WIRE |
| 9 | HBPP-44004 | 4 | 96906 | MS-51957-13 | 4-40 X 1/4 PAN |
| 10 | HWSS-40300 | 4 | 96906 | MS35338-135 | #4 X 3/16 SPLIT LOCK |
| 11 | HWFS-40400 | 4 | 96906 | MS15795-803 | #4 X 1/4 FLAT WASHER |
| 12 | HBPP-25603 | 32 | 96906 | MS-51957-2 | 2-56 X 3/16 PAN |
| 13 | HWSS-20200 | 32 | 96906 | MS35338-134 | #2 X 1/8 SPLIT LOCK |
| C 1 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 2 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 3 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 4 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 5 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 6 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 7 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 8 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 9 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 10 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 11 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 12 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 13 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 14 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 15 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 16 | CC50-02150 | 1 | 51642 | 200-050-NPO-152J | 1500 PF CERAMIC |
| C 18 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 19 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 20 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 21 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| CX 17 | CC50-????? | Ref | 51642 | 150-100-COG-???J | SELECTED IN TEST |
| J 1 | JRBM-00000 | 1 | 98291 | 51-045-0000 | SMB M BULK MOUNT |
| J 2 | JRBM-00000 | 1 | 98291 | 51-045-0000 | SMB M BULK MOUNT |
| J 3 | JRBM-00000 | 1 | 98291 | 51-045-0000 | SMB M BULK MOUNT |
| J 4 | JRBM-00000 | 1 | 98291 | 51-045-0000 | SMB M BULK MOUNT |
| J 5 | JRBM-00000 | 1 | 98291 | 51-045-0000 | SMB M BULK MOUNT |
| J 6 | JRBM-00000 | 1 | 98291 | 51-045-0000 | SMB M BULK MOUNT |
| J 7 | JRBM-00000 | 1 | 98291 | 51-045-0000 | SMB M BULK MOUNT |
| L 1 | LAD0-08120 | 1 | 72259 | WEE-1200 | 1200 UH INDUCTOR |
| L 2 | LAD0-08120 | 1 | 72259 | WEE-1200 | 1200 UH INDUCTOR |
| L 3 | LAD0-06100 | 1 | 72259 | WEE-10 | 10 UH INDUCTOR |
| L 4 | LAD0-06100 | 1 | 72259 | WEE-10 | 10 UH INDUCTOR |
| P 1 | LFT0-83208 | 1 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| P 2 | LFT0-83208 | 1 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| P 3 | LFT0-83208 | 1 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| P 4 | LFT0-83208 | 1 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| P 5 | LFT0-83208 | 1 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| P 6 | LFT0-83208 | 1 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| P 7 | LFT0-83208 | 1 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| Q 1 | QMNS-00214 | 1 | 06049 | SD214DE | SD214DE,5V VGS |
| Q 2 | QMNS-00214 | 1 | 06049 | SD214DE | SD214DE,5V VGS |
| Q 3 | QMNS-00214 | 1 | 06049 | SD214DE | SD214DE,5V VGS |

**Parts List for 120BA07900 DETECTOR BUFFER PCA Rev D (A200)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| Q 4 | QMNS-00214 | 1 | 06049 | SD214DE | SD214DE,5V VGS |
| Q 5 | QMNS-00214 | 1 | 06049 | SD214DE | SD214DE,5V VGS |
| R 1 | RN55-21910 | 1 | 81349 | RN55C1912F | 19.1 K OHMS 1% MET FILM |
| R 2 | RN50-22000 | 1 | 65940 | CRB20FX2002 | 20.0K;M F;1/5W;1%;100PPM |
| R 3 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 4 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 5 | RN50-05620 | 1 | 65940 | CRB20FX5620 | 562;M F;1/5W;1%;100PPM |
| R 6 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 7 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 8 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 9 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 10 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 11 | RN50-19090 | 1 | 65940 | CRB20FX9091 | 9.09K;M F;1/5W;1%;100PPM |
| R 12 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 13 | RN50-04020 | 1 | 65940 | CRB20FX4020 | 402;M F;1/5W;1%;100PPM |
| R 14 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 15 | RN55-22000 | 1 | 81349 | RN55C2002F | 20 K OHMS 1% MET FILM |
| R 16 | RN55-06650 | 1 | 81349 | RN55C6650F | 665 OHMS 1% MET FILM |
| R 18 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 19 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 20 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 21 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 22 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 23 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| U 1 | UON0-00840 | 1 | 24355 | AD840JN | AD840 OP AMP |
| U 2 | UON0-00845 | 1 | 24355 | AD845JN | AD845 OP AMP |
| U 3 | UON0-00420 | 1 | 63542 | MAX420CPA | LM420 CMOS OP AMP |
| U 4 | ULN0-02901 | 1 | 27014 | LM2901N | LM2901N QUAD COMPARATOR |
| U 5 | UON0-00037 | 1 | 24355 | ADOP37GN | ADOP37 OP AMP |

**Parts List for 120CA11500 100MHz MODULE ASY Rev F (A201)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 004BA00001 | 1 | 58900 | 004BA00001 | SAMPLER ASSEMBLY |
| 2 | 101BF04300 | 2 | 58900 | 101BF04300 | SAMPLER IF WALL |
| 3 | 101BF04400 | 1 | 58900 | 101BF04400 | SAMPLER DRIVER WALL |
| 4 | 101BF04500 | 1 | 58900 | 101BF04500 | SAMPLER DRIVER SUPPORT |
| 5 | 101BF04600 | 2 | 58900 | 101BF04600 | SAMPLER IF SUPPORT |
| 6 | 101BF25901 | 1 | 58900 | 101BF25901 | CONNECT.MTG PLATE 100MHz |
| 8 | 101CF25801 | 1 | 58900 | 101CF25801 | 100 MHz MODULE COVER |
| 9 | LFT0-83208 | 8 | 59660 | 4205-005-S | FEED-THRU FILTER 15A |
| 10 | JRBM-00000 | 4 | 98291 | 51-045-0000 | SMB M BULK MOUNT |
| 11 | LFT1-83208 | 1 | 59660 | 4205-022-S | FEED-THRU FILTER 15A |
| 12 | URC0-07905 | 1 | 04713 | MC7905.2CT | MC7905.2CT 1A -5.2V REG |
| 14 | HQWN-02200 | 1 | 04713 | B51547F019 | TO220 SHOULDER WASHER |
| 15 | HQIS-01260 | 1 | 55285 | 7403-09FR-51 | TO126 INSULATOR |
| 16 | ETI0-07555 | 2 | 98291 | 0011038000479 | FEED THRU TERMINAL |
| 23 | RN55-01300 | 1 | 81349 | RN55C1300F | 130 OHMS 1% MET FILM |
| 24 | RN55-00825 | 1 | 81349 | RN55C82R5F | 82.5 OHMS 1% MET FILM |
| 25 | 101CA04200 | 1 | 58900 | 101CA04200 | 100MHZ MODULE PCA |
| 26 | GELS-26125 | Ref | 04552 | LS26-1/8 | LS26 ECCOSORB |
| 27 | 004BA00101 | 1 | 58900 | 004BA00101 | SAMPLER ASSY REVERSE MTG |
| 101 | HBPP-44005 | 1 | 96906 | MS-51957-14 | 4-40 X 5/16 PAN |
| 102 | HQWC-01260 | 1 | 04713 | B52200F006 | TO126 DOME WASHER |
| 103 | HWFS-40400 | 1 | 96906 | MS15795-803 | #4 X 1/4 FLAT WASHER |
| C 1 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 65 | CC50-01120 | 1 | 51642 | 150-100-COG-121 | 120 PF CERAMIC NPO |
| L 6 | LAD0-06270 | 1 | 72259 | WEE-27 | 27 UH INDUCTOR |
| L 7 | LAD0-04150 | 1 | 72259 | WEE-.15 | .15 UH INDUCTOR |
| L 8 | LAD0-04150 | 1 | 72259 | WEE-.15 | .15 UH INDUCTOR |

**Parts List for 101CA04200 100MHZ MODULE PCA Rev R (A201)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 101CF04200 | 1 | 58900 | 101CF04200 | 100MHZ MODULE PCB |
| 2 | ETSB-06216 | 24 | 88245 | 2000B | BIFURCATED TERMINAL 5/32 |
| C 1 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 2 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 3 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 4 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 5 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 6 | CT20-06100 | 1 | 56289 | 150D106X9020B2 | 10 UF 20V TANTALUM |
| C 7 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 8 | CC50-00120 | 1 | 51642 | 150-100-COG-120J | 12 PF CERAMIC NPO |
| C 9 | CC50-00120 | 1 | 51642 | 150-100-COG-120J | 12 PF CERAMIC NPO |
| C 10 | CC50-00470 | 1 | 52763 | EDPT-47-NPO-5% | 47 PF CERAMIC NPO |
| C 11 | CT20-06100 | 1 | 56289 | 150D106X9020B2 | 10 UF 20V TANTALUM |
| C 12 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 13 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 14 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CT20-06100 | 1 | 56289 | 150D106X9020B2 | 10 UF 20V TANTALUM |
| C 17 | CT20-06100 | 1 | 56289 | 150D106X9020B2 | 10 UF 20V TANTALUM |
| C 18 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 19 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 20 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 21 | CC50-00150 | 1 | 52763 | EDPT-15-NPO-5% | 15 PF CERAMIC NPO |
| C 22 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 23 | CV00-01012 | 1 | 18736 | EF14 | 1-14 PF VARIABLE |
| C 24 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 25 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 26 | CC50-00047 | 1 | 51642 | 100-100-COG-479J | 4.7 PF CERAMIC NPO |
| C 27 | CC50-00100 | 1 | 51642 | 100-100-COG-100J | 10 PF CERAMIC NPO |
| C 28 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 29 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 30 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 31 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 32 | CV00-09035 | 1 | 59660 | 538011D 9-35 | 9-35 PF VARIABLE |
| C 33 | CV00-09035 | 1 | 59660 | 538011D 9-35 | 9-35 PF VARIABLE |
| C 34 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 35 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 36 | CT20-06100 | 1 | 56289 | 150D106X9020B2 | 10 UF 20V TANTALUM |
| C 37 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 38 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 39 | CC50-00680 | 1 | 51642 | 150-100-COG-680J | 68 PF CERAMIC NPO |
| C 40 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 41 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 42 | CC50-00680 | 1 | 51642 | 150-100-COG-680J | 68 PF CERAMIC NPO |
| C 43 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 44 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 45 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 46 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 47 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 48 | CT20-06100 | 1 | 56289 | 150D106X9020B2 | 10 UF 20V TANTALUM |
| C 49 | CC50-00150 | 1 | 52763 | EDPT-15-NPO-5% | 15 PF CERAMIC NPO |
| C 50 | CC50-00180 | 1 | 51642 | 150-100-COG-180J | 18 PF CERAMIC NPO |
| C 51 | CT20-06100 | 1 | 56289 | 150D106X9020B2 | 10 UF 20V TANTALUM |
| C 52 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 53 | CC50-00470 | 1 | 52763 | EDPT-47-NPO-5% | 47 PF CERAMIC NPO |
| C 54 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 55 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 57 | CC50-00470 | 1 | 52763 | EDPT-47-NPO-5% | 47 PF CERAMIC NPO |

**Parts List for 101CA04200 100MHZ MODULE PCA Rev R (A201)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| C 58 | CC50-00470 | 1 | 52763 | EDPT-47-NPO-5% | 47 PF CERAMIC NPO |
| C 59 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 60 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 61 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 62 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 63 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 66 | CC50-00018 | 1 | 51642 | 100-100-NPO-189C | 1.8 PF CERAMIC NPO |
| CR 1 | DVA0-00109 | 1 | 26629 | KV3901 | MV109 6-30 PF DIODE |
| CR 2 | DSA0-02810 | 1 | 28480 | 5082-2810 | 5082-2810 SCHOT. DIODE |
| HR 1 | Y35H-00150 | 1 | 12020 | TO5M-2D | 15V H-35/U CRYSTAL OVEN |
| L 1 | LAD0-05150 | 1 | 72259 | WEE-1.5 | 1.5 UH INDUCTOR |
| L 2 | LAD0-05270 | 1 | 72259 | WEE-2.7 | 2.7 UH INDUCTOR |
| L 3 | 420BA18006 | 1 | 58900 | 420BA18006 | HANDWOUND INDUCTOR, 6 1/ |
| L 4 | 420BA18006 | 1 | 58900 | 420BA18006 | HANDWOUND INDUCTOR, 6 1/ |
| Q 1 | QBNS-06304 | 1 | 04713 | 2N6304 | 2N6304 15V 1400MHZ NPN |
| Q 2 | QBNS-06304 | 1 | 04713 | 2N6304 | 2N6304 15V 1400MHZ NPN |
| Q 3 | QBNS-04275 | 1 | 27014 | PN4275 | PN4275 .1A 15V .6W NPN |
| Q 4 | QBNS-04275 | 1 | 27014 | PN4275 | PN4275 .1A 15V .6W NPN |
| Q 5 | QBNS-04275 | 1 | 27014 | PN4275 | PN4275 .1A 15V .6W NPN |
| Q 6 | QBNS-04275 | 1 | 27014 | PN4275 | PN4275 .1A 15V .6W NPN |
| Q 7 | QBNS-06304 | 1 | 04713 | 2N6304 | 2N6304 15V 1400MHZ NPN |
| R 1 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 2 | RN55-03320 | 1 | 81349 | RN55C3320F | 332 OHMS 1% MET FILM |
| R 3 | RN55-03320 | 1 | 81349 | RN55C3320F | 332 OHMS 1% MET FILM |
| R 4 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 5 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 6 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 7 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 8 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 9 | RN55-15620 | 1 | 81349 | RN55C5621F | 5.62 K OHMS 1% MET FILM |
| R 10 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 11 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |
| R 12 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| R 14 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 15 | RN55-22210 | 1 | 81349 | RN55C2212F | 22.1 K OHMS 1% MET FILM |
| R 16 | RN55-14750 | 1 | 81349 | RN55C4751F | 4.75 K OHMS 1% MET FILM |
| R 17 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 18 | RN55-21000 | 1 | 81349 | RN55C1002F | 10 K OHMS 1% MET FILM |
| R 19 | RN55-16810 | 1 | 81349 | RN55C6811F | 6.81 K OHMS 1% MET FILM |
| R 20 | RN55-13920 | 1 | 81349 | RN55C3921F | 3.92 K OHMS 1% MET FILM |
| R 21 | RN55-03320 | 1 | 81349 | RN55C3320F | 332 OHMS 1% MET FILM |
| R 22 | RN55-03320 | 1 | 81349 | RN55C3320F | 332 OHMS 1% MET FILM |
| R 23 | RN55-11300 | 1 | 81349 | RN55C1301F | 1.3 K OHMS 1% MET FILM |
| R 24 | RN55-01500 | 1 | 81349 | RN55C1500F | 150 OHMS 1% MET FILM |
| R 25 | RN55-01500 | 1 | 81349 | RN55C1500F | 150 OHMS 1% MET FILM |
| R 26 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 27 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 28 | RN55-03320 | 1 | 81349 | RN55C3320F | 332 OHMS 1% MET FILM |
| R 29 | RN55-03320 | 1 | 81349 | RN55C3320F | 332 OHMS 1% MET FILM |
| R 30 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 31 | RN55-01000 | 1 | 81349 | RN55C1000F | 100 OHMS 1% MET FILM |
| R 32 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 33 | RN55-03320 | 1 | 81349 | RN55C3320F | 332 OHMS 1% MET FILM |
| R 34 | RN55-03320 | 1 | 81349 | RN55C3320F | 332 OHMS 1% MET FILM |
| R 35 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 36 | RN55-11000 | 1 | 81349 | RN55C1001F | 1 K OHMS 1% MET FILM |
| R 37 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |

**Parts List for 101CA04200 100MHZ MODULE PCA Rev R (A201)**

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 38 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 39 | RN55-05620 | 1 | 81349 | RN55C5620F | 562 OHMS 1% MET FILM |
| R 40 | RN55-15620 | 1 | 81349 | RN55C5621F | 5.62 K OHMS 1% MET FILM |
| R 41 | RN55-02740 | 1 | 81349 | RN55C2740F | 274 OHMS 1% MET FILM |
| R 42 | RN55-00100 | 1 | 81349 | RN55C10R0F | 10 OHMS 1% MET FILM |
| R 43 | RN55-12210 | 1 | 81349 | RN55C2211F | 2.21 K OHMS 1% MET FILM |
| U 1 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 2 | UANP-00733 | 1 | 07263 | UA733DC | UA733DC VIDEO AMP |
| U 3 | URP0-78120 | 1 | 04713 | MC78L12CP | MC78L12CP .1A 12V REG |
| U 4 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 5 | UEN0-10216 | 1 | 04713 | MC10216P | MC10216P TRIPLE RCVR |
| U 6 | UANP-00733 | 1 | 07263 | UA733DC | UA733DC VIDEO AMP |
| Y 1 | Y350-10000 | 1 | 00809 | C357-44/100.0000MHz | 100MHz CRYSTAL HC-35U |

## *LIST OF MANUFACTURERS*

The names and addresses of manufacturers cited in the preceding parts lists are shown on the following pages. Each manufacturer is listed under its CAGE number (COMMERCIAL AND GOVERNMENT ENTITY), as noted in the parts lists. In a few cases, no CAGE number has been assigned; these manufacturers are referenced by Giga-tronics codes which are shown at the end of the list.

| CAGE | NAME | ADDRESS |
|---|---|---|
| 0AG18 | Hirose Electric USA Inc | Chatsworth, CA |
| 0AX52 | Ditom | 1180 Coleman Ave #103 San Jose, CA 95110 |
| 0B0A9 | Dallas Semiconductor Corp | 6350 Beltwood Pky S Dallas, TX 75244 |
| 0BE81 | Aerovox-Mallory | 20 Aberdeen Dr Glasgow, KY 42141 |
| 0D2A6 | Mitsubishi Electronics Inc | 1050 East Arques Ave Sunnyvale, CA 94086 |
| 0D3V2 | Menlo Industries Inc | 44060 Old Warm Springs Blvd<br>Fremont, CA 94538 |
| 0GP12 | Radiall Inc | 150 Long Beach Blvd Stratford, CT 06497 |
| 0HS44 | Pacific Millimeter | 189 Linbrook Dr San Diego, CA 92111 |
| 0HFH6 | Futaba Corporation of America | 555 West Victoria St Compton, CA 90220 |
| 0HFJ2 | Microplastic | 9180 Gazette Ave Chatsworth, CA 91311 |
| 0J7V3 | Amp Inc | 19200 Stevens Creek Blvd Suite 1<br>Cupertino, CA 95014 |
| 00443 | Waveline Inc | 160 Passaic Ave West Caldwell, NJ 07006 |
| 00656 | Aerovox Inc | 740 Belleville Ave New Bedford, MA 02745 |
| 00750 | Air Track Mfg Corp | College Park, MD |
| 00809 | Croven Crystals | 500 Beech St Whitby, Ontario, CAN L1N5S5 |
| 00815 | Midland - Ross | 357 Beloit St Burlington, WI 53105 |
| 01121 | Allen-Bradley Co | 1201 South 2nd St Milwaukee, WI 53204 |
| 01295 | Texas Instruments Inc | 13500 N. Central Expwy Dallas, TX 75265 |
| 01963 | Cherry Electrical Products | 3600 Sunset Ave Waukegan, IL 60087 |
| 02660 | Amphenol Corp | 2801 South 25th Ave Broadview, IL 60153 |
| 02735 | RCA Corp | Route 202 Somerville, NJ 08876 |
| 03614 | Bussman Mfg | 114 Old St Rd PO Box 144 St Louis, MO 63178 |
| 04222 | AVX Ceramics Div of AVX Corp | 19th Ave South PO Box 867<br>Myrtle Beach, SC 29577 |
| 04426 | ITW Switches | 6615 West Irving Park Rd Chicago, IL 60634 |
| 04552 | Grace W R and Co | 869 Washington St Canton, MA 02021 |
| 04713 | Motorola Inc | 5005 East McDowell Rd Phoenix, AZ 85008 |
| 05236 | Jonathan Manufacturing Corp | 1101 South Acacia Ave Fullerton, CA 92631 |
| 05245 | Corcom Inc | 1600 Winchester Rd Libertyville, IL 60048 |
| 05276 | ITT Pomona Electronics Div | 1500 E 9th St PO Box 2767<br>Pomona, CA 91766 |
| 05791 | Lyn-Tron Inc | 3150 Damon Way Burbank, CA 91505 |
| 05820 | EG and G Wakefield Engineering | 60 Audubon Rd Wakefield, MA 01880 |
| 05905 | Jerobee Industries Inc | Redmond, WA |

| CAGE | NAME | ADDRESS |
|---|---|---|
| 06049 | Topaz Inc | 9192 Topaz Way San Diego, CA 92123 |
| 06349 | Cam-Lok Div Empire Product Inc | 10540 Chester Rd Cincinnati, OH 45215 |
| 06383 | Panduit Corp | 17301 Ridgeland Tinley Park, IL 60477 |
| 06540 | Mite Corp | 466 Blake St New Haven, CT 06515 |
| 06776 | Robinson Nugent Inc | 800 East 8th St New Albany, IN 47150 |
| 07180 | Sage Laboratories Inc | East Natick Industrial Park 3 Huron Dr<br>Natick, MA 01760 |
| 07263 | Fairchild Camera & Instrument | 464 Ellis St Mountain View, CA 94039 |
| 07512 | Oak Materials Group Inc | McCaffery St Hoosick Falls, NY 12090 |
| 07556 | Calabro Industries Inc | 1372 Enterprise Dr West Chester, PA 19380 |
| 09022 | Cornell-Dubilier Electric Corp | 1605 Rodney French Blvd<br>New Bedford, MA 93790 |
| 09353 | C and K Components Inc | 15 Riverdale Ave Newton, MA 02158 |
| 09922 | Burndy Corp | Richards Ave Norwalk, CT 06856 |
| 09969 | Dale Electronics Inc | East Highway 50 PO Box 180<br>Yankton, SD 57078 |
| 1AU47 | Lucas Weinschel Inc | 1 Weinschel Ln PO Box 6001 Gaithersburg, MD |
| 1BR23 | CW Industries | |
| 1CY63 | Sierra Microwave Technology | 11295-B Sunrise Gold Circle<br>Rancho Cordova, CA 95670 |
| 1DS68 | Sumner Mfg Inc | Hwy 411 S-Sumner Dr PO Drawer A<br>Rome, GA 30162 |
| 1ES66 | Maxim Intergrated Products | 510 North Pastoria Ave Sunnyvale, CA 94086 |
| 1FN41 | Atmel Corp | 2125 Onel Dr. San Jose, CA 95131 |
| 1W232 | Spacek Labs | 528 Santa Barbara St Santa Barbara, CA 93101 |
| 1Y147 | Virtech | 805 G University Ave Los Gatos, CA 95030 |
| 11532 | Teledyne Relays | 12525 Daphne Ave Hawthorne, CA 90250 |
| 11769 | Elco/Dyntech Div of Elco Corp | 1225 East Wakeham Ave Santa Ana, CA 92702 |
| 12020 | Ovenaire Div of Electronic Tech | 706 Forrest St Charlottesville, VA 22901 |
| 12457 | Merrimac Industries Inc | 41 Fairfield Pl West Caldwell, NJ 07006 |
| 13103 | Thermalloy Co Inc | 2021 W. Valley View Lane Dallas, TX 75381 |
| 13511 | Amphenol Cadre Div Bunker Ramo Corp | Los Gatos, CA |
| 13708 | Allied Components | Inglewood, CA |
| 13919 | Burr-Brown Reserch Corp | 6730 South Tucson Blvd Tucson, AZ 85734 |
| 14482 | Watkins-Johnson Co | 3333 Hillview Ave Palo Alto, CA 94304 |
| 14604 | Elmwood Sensors Inc | 500 Narragansett Park Dr Pawtucket, RI 02861 |
| 14936 | General Instrument | 600 West John St Hicksville, NY 11820 |

| CAGE | NAME | ADDRESS |
|---|---|---|
| 15268 | RHG Electronics Laboratory Inc | 161 East Industry Ct Deer Park, NY 11729 |
| 15542 | Mini-Circuits Laboratory | 2625 East 14th St Brooklyn, NY 11235 |
| 15915 | Tepro of Florida Inc | 2608 Enterprise Rd Clearwater, FL 33517 |
| 16179 | M/A-Com Omni Spectra Inc | 21 Continental Blvd Merrimack, NH 03054 |
| 16352 | Codi Corp | 350 Hurst St Linden, NJ 07036 |
| 16428 | Cooper Belden Electronic Wire | Northwest N St Richmond, IN 47374 |
| 16453 | Western Microwave Inc | 495 Mercury Dr Sunnyvale, CA 94086 |
| 16508 | Aerovox Corp | 19th Ave S. PO Box 867<br>Myrtle Beach, SC 29577 |
| 16733 | Cablewave Systems Inc | 60 Dodge Ave North Haven, CT 06473 |
| 17217 | Gore W L and Associates Inc | 555 Paper Mill Rd Newark, DE 19714 |
| 17540 | Alpha Industries Inc | 20 Sylvan Rd Woburn, MA 01801 |
| 17856 | Siliconix Inc | 2201 Laurelwood Rd Santa Clara, CA 95054 |
| 18310 | Concord Electronic Corp | 30 Great Jones St New York, NY 10012 |
| 18324 | Signetics Corp | 4130 South Market Ct Sacramento, CA 95834 |
| 18364 | Mag-Tool Co | 940 American St San Carlos, CA 94070 |
| 18714 | RCA Corp Findlay Plant | 1700 Fostoria Rd Findlay, OH 45840 |
| 18736 | Voltronics Corp | West St East Hanover, NJ 07936 |
| 19089 | Swimrite Mfg Co Inc | Van Nuys, CA |
| 19701 | Mepco/Electra Inc | P.O. Box 760 Mineral Wells, TX 76067 |
| 2J873 | Celeritex Inc | 617 River Oaks Pky San Jose, CA 95134 |
| 2J899 | Dynawave Inc | 94 Searle St PO Box 938<br>Georgetown, MA 01833 |
| 2M734 | Panasonic Co | P.O. Box 1502 Secaucus, NJ 07094 |
| 2V941 | Microsource Inc | 1269 Corporate Ctr Pky Sana Rosa, CA<br>95407 |
| 20550 | Engineering Mfg Co | Sheboygan, WI |
| 20944 | Wiltron Co | 805 East Middlefield Rd<br>Mountain View, CA 94042 |
| 20999 | Minnesota Mining and Mfg Co | 3M Center St Paul, MN 55101 |
| 21604 | Buckeye Stamping Co | 555 Marion Rd Columbus, OH 43207 |
| 21847 | TRW Microwave Inc | 825 Stewart Dr Sunnyvale, CA 94086 |
| 22519 | Data Delay Devices | 385 Lakeview Ave Clifton, NJ 07011 |
| 23899 | Van Petty Mfg Inc | 1168 Tourmaline Dr Newbury Park, CA 91320 |
| 23936 | Pamotor | 770 Airport Blvd Burlingame, CA 94010 |
| 24355 | Analog Devices Inc | Rt 1 Industrial Park Norwood, MA 02062 |
| 24253 | ITT Pomona Electronics Div | 1500 E 9th St PO Box 2767<br>Pomona, CA 91766 |

| CAGE | NAME | ADDRESS |
|---|---|---|
| 24539 | Avantek Inc | 3175 Bowers Ave Santa Clara, CA 95051 |
| 24931 | Specialty Connector Co Inc | 2100 Earlywood Dr PO Box 547<br>Franklin, IN 46131 |
| 24995 | Enviromental Container System | 3560 Rouge River Hwy Grants Pass, OR 97526 |
| 26066 | Minnesota Mining and Mfg. Co | 3M Center St Paul, MN 55101 |
| 26629 | Frequency Sources Inc | 16 Maple Rd Chelmsford, MD 01824 |
| 26692 | B and S Tool & Die Company | 2300 Sulphur Spring Rd Baltimore, MD 21227 |
| 26922 | Cetec Corp | 9900 Baldwin Place El Monte, CA 91731 |
| 26923 | Control Master Products Inc | 1062 Shary Circle Concord, CA 94518 |
| 27014 | National Semiconductor Corp | 2900 Semiconductor Dr Santa Clara, CA 95051 |
| 27264 | Molex Inc | 2222 Wellington Ct Lisle, IL 60532 |
| 27802 | Vectron Laboratories Inc | 166 Gover Ave Norwalk, CT 06850 |
| 27851 | Film Microelectronics | 17 A St Burlington, MA 01803 |
| 28480 | Hewlett Packard Co | 3000 Hanover St Palo Alto, CA 94304 |
| 28520 | Heyco Molded Products | 750 Boulevard PO Box 160<br>Kenilworth, NJ 07033 |
| 29005 | Storm Products Co | 112 South Glasglow Ave Inglewood, CA 90301 |
| 29111 | Trak Microwave Corp | 735 Palomar Ave Sunnyvale, CA 94086 |
| 29990 | American Technical Ceramics | One Nordon Lane Huntington Stn, NY 11746 |
| 3A054 | McMaster-Carr Supply Co | 9630 Norwalk Blvd Santa Fe Springs, CA 90670 |
| 3E364 | Vemaline | 333 Strawberry Field Rd Warwick, RI 02887 |
| 3W023 | Philips Components<br>Discrete Product Div | 5083 Kings Hwy<br>Saugerties, NY 12477 |
| 31433 | Union Carbide Corp | Hwy 276 SE Greenville, SC 29606 |
| 31703 | Gudrun Frederickson Co | Oakland, CA |
| 31757 | Micrpac Industries Inc | 905 E. Walnut St Garland, TX 75040 |
| 31781 | Edac Inc | 20 Railside Rd Don Mills, Ont CAN M3A1A4 |
| 31918 | ITT Schadow Inc | 8081 Wallace Rd Eden Prarie, MN 55344 |
| 32293 | Intersil Inc | 10600 Ridgeview Ct Cupertino, CA 95014 |
| 32559 | Bivar Inc | 4 Thomas St Irvine, CA 92718 |
| 32767 | Griffith Plastics Corp | 1027 California Dr Burlingame, CA 94010 |
| 32997 | Bourns Inc Trimpot Division | 1200 Columbia Ave Riverside, CA 92507 |
| 33592 | Miteq Inc | 100 Davids Dr Huappauge, NY 11787 |
| 34031 | Analog Devices | 7810 Success Rd Greensboro, NC 27409 |
| 34078 | Midwest Microwave Inc | 3800 Packard Rd Ann Arbor, MI 48104 |
| 34576 | Rockwell International Corp | 4311 Jamboree Rd Newport Beach, CA 92660 |
| 34781 | MCW Industries | 129 Southside Drive Charlotte, NC 28210 |

| CAGE | NAME | ADDRESS |
|---|---|---|
| 34785 | Dek Inc | 3480 Swenson Ave St Charles, IL 60174 |
| 36437 | Star Stainless Products Ltd | Montreal, Que CAN H4T1N8 |
| 4F708 | Hammond Mfg Co US Inc | 1690 Walden Drive Buffalo, NY 14225 |
| 4R125 | Magnetec Corp | 61 W Dudleytown Rd Bloomfield, CT 06002 |
| 46384 | Penn Engineering & Mfg Corp | Old Easton Rd PO Box 1000<br>Danboro, PA 18916 |
| 5J927 | Interface Technology Div of Dynatech Corp | 2100 E Alcosta Ave<br>Glendora, CA 91740 |
| 50721 | General Electric | 11 Chabot Blvd Mansfield, MA 02048 |
| 51167 | Aries Electronics Inc | 62 Trenton Ave Frenchtown, NJ 08825 |
| 51284 | Mos Technology Inc | 950 Rittenhouse Rd Norristown, PA 19401 |
| 51642 | Centre Engineering Co | 2820 East College Ave State College, PA 16801 |
| 51705 | Icco Rally | 2575 East Bayshore Rd Palo Alto, CA 94303 |
| 52063 | Exar Integrated Systems | 750 Palomar Ave Sunnyvale, CA 94088 |
| 52072 | Circuit Assembly Corp | 18 Thomas St Irvine, CA 92714 |
| 52648 | Plessey Trading Corp | 1641 Kaiser Ave Irvine, CA 92714 |
| 52683 | Baytron Co Inc | 344 Salem St Medford, MA 02155 |
| 52763 | Stettner Electronics Inc | 6135 Airways Blvd Chattanooga, TN 37421 |
| 52840 | Western Digital Corp | 3128 Red Hill Ave Costa Mesa, CA 92626 |
| 53387 | Minnesota Mining & Mfg Co Electronic Products Div 3M | Auxtin, TX |
| 54186 | Micro Power Systems Inc | 3100 Alfred St Santa Clara, CA 95050 |
| 54343 | Riedel M W and Co | 300 Cypress Ave Alhambra, CA 91801 |
| 54487 | Micronetics Inc | 36 Oak St Norwood, NJ 07648 |
| 54583 | TDK Electronics Corp | 12 Harbor Park Dr Port Washington, NY 11550 |
| 55153 | Dielectric Laboratories Inc | 69 Albany St Cazenovia, NY 13035 |
| 55261 | LSI Computer Systems Inc | 1235 Walt Whitman Rd Melville, NY 11747 |
| 55285 | Bergquist Co Inc | 5300 Edina Industrial Blvd<br>Minneapolis, MN 55435 |
| 55322 | Samtec Inc | 810 Progress Blvd PO Box 1147<br>New Albany, IN 47150 |
| 55387 | Pamtech | 8030 Remmet Ave Canoga Park, CA 91304 |
| 55566 | R A F Electronic Hardware | 95 Silvermine Rd Seymour, CT 06483 |
| 55576 | Synertek | 3001 Stender Way Santa Clara, CA 95051 |
| 55680 | Nichicon America Corp | 927 E State Pky Schaumburg IL 60195 |
| 56248 | Consolidated Refining Co | 115 Hoyt Ave Mamaroneck, NY 10543 |
| 56289 | Sprague Electric Co | 87 Marshall St North Adams, MA 01247 |
| 56501 | Thomas & Betts Corp | 920 Route 202 Raritan, NJ 08869 |

| CAGE | NAME | ADDRESS |
|---|---|---|
| 56563 | Alatec Products | 12747 Saticoy St North Hollywood, CA 91605 |
| 57032 | Daden Associates Inc | 23011 Moulton Pky A-12 Laguna Hills, CA 92653 |
| 57793 | United Microwave Products Inc | 185 West 205th St Torrance, CA 90503 |
| 58202 | Innowave Inc | 15555 Concord Circle Morgan Hill, CA 95037 |
| 58361 | General Instrument Corp | 3400 Hillview Ave Palo Alto, CA 94304 |
| 58377 | National Electronics | 11731 Markon Dr Garden Grove, CA 92641 |
| 58684 | Magnetec Corp | 61 W Dudleytown Rd Bloomfield, CT 06002 |
| 58900 | Giga-tronics Inc | 2495 Estand Way Pleasant Hill, CA 94523 |
| 59124 | KOA Speer Electronics Inc | Bolivar Dr PO Box 547 Bradford, PA 16701 |
| 59365 | Metelics Corp | 975 Stewart Dr Sunnyvale CA 94086 |
| 59660 | Tusonix Inc | 2155 N. Forbes Blvd #107 Tucson, AZ 85745 |
| 59942 | AVX Filters Corp | 11144 Penrose St Sun Valley, CA 91352 |
| 59980 | Midwest Polychem Ltd | 1502 N 25th Ave Melrose Park, IL 60160 |
| 6A566 | Tecknit Corp | 320 North Nopal St Santa Barbara, CA 93103 |
| 6V806 | Frammar Mfg Inc (formerly Omni Spectra Corp) | 6859 Tujunga Ave North Hollywood CA 91605 |
| 6Y341 | Microwave Technology Inc | 4268 Solar Way Fremont, CA 94538 |
| 60393 | Precision Resistive Products | 655 Main St Mediapolis, IA 52637 |
| 60395 | Xicor Inc | 851 Buckeye Ct Milpitas, CA 95035 |
| 60450 | Microwave Components Inc | 7 Meehan Dr Chelmsford, MA 01824 |
| 60583 | Narda Microwave Corp | 11040 White Rock Rd Suite 200<br>Rancho Cordova, CA 95670 |
| 60644 | CSDC | P.O. Box 2116 Wayne, NJ 07470 |
| 61104 | Aris Engineering Corp | 30 Bond St Haverhill, MA 01830 |
| 61485 | Hitachi Denshi America Ltd | 175 Croossways Park Way Woodbury, NY 11797 |
| 61638 | Advanced Interconnections | 5 Energy Way West Warwick, RI 02893 |
| 61772 | Integrated Device Technology | 3236 Scott Blvd PO Box 58015<br>Santa Clara, CA 95052 |
| 61802 | Toshiba International | 13131 West Little York Rd Houston, TX 77041 |
| 61964 | Omron Electronics Inc | 1E Commerce Schaumburg, IL 60173 |
| 62331 | Krytar Inc | 1292 Anvilwood Ct Sunnyvale, CA 94086 |
| 62559 | Schroff Inc | 170 Commerce Dr Warwick, RI 02886 |
| 63058 | McKenzie Socket Technology Inc | 44370 Old Warm Springs Blvd<br>Fremont, CA 94538 |
| 63132 | Time Microwave | 398 Martin Ave Santa Clara, CA 95050 |
| 63468 | Electro Dynamics | 5625 Foxridge Dr Shawnee Mission, KS 66201 |
| 63542 | Hall-Mark Electronics Corp | 11333 Pagemill Rd Dallas, TX 75222 |

| CAGE | NAME | ADDRESS |
|---|---|---|
| 64135 | Filter Concepts | 2624 S. Rousselle St Santa Ana, CA 92707 |
| 64155 | Linear Technology Corp | 1630 McCarthy Blvd Milpitas, CA 95035 |
| 64671 | Inmet Corp | 7155 Jackson Rd Ann Arbor, MI 48103 |
| 64859 | AP Products Inc | 9325 Progress Parkway Mentor, OH 44061 |
| 65032 | Rogers Corp | P.O. Box 700 Chandler, AZ 85224 |
| 65449 | Amtex Intl Inc | 1878 Star Batt Rochester, MI 48063 |
| 65517 | Ayer Engineering Co | 1250 West Roger Rd Tucson, AZ 85705 |
| 65664 | Catamount Mfg Inc | Governor Dr PO Box 720 Orange, MA 01364 |
| 65940 | Rohm Corp | 8 Whatney Irvine, CA 92714 |
| 66039 | Kaycor International | 1732 Central St Evanston, IL 60201 |
| 66148 | Fairlane Fluid/Air Products | 23435 Industrial Park Dr Farmington, MI 48024 |
| 66449 | Microsource Inc | 1269 Corporate Center Pky<br>Santa Rosa, CA 95407 |
| 66466 | Standard Instrumentation Inc | 3322 Pennsylvania Ave Charleston, WV 25302 |
| 66544 | Continental Microwave & Tool Co | 10 Merrill Industrial Dr<br>Hampton, NH 03842-0998 |
| 66579 | Waferscale Intergraton | 47280 Kato Rd Fremont, CA 94538 |
| 66958 | SGS Semiconductor Corp | 7117 E. 3rd Ave Scottsdale, AZ 52251 |
| 67297 | Herotek Inc. | 265 J Sobrante Way Sunnyvale, CA 94086 |
| 68459 | River Run Enterprises Inc | 2001 Jefferson Davis Ave Selma, AL 36701 |
| 7E222 | Littlefuse Tracor Inc | 800 E Northwest Hwy Des Plaines, IL 60016 |
| 7E585 | Zero Mfg | 777 Front St Burbank, CA 91303 |
| 7M800 | Analog Devices Inc | 2444 Moorpark Ave San Jose, CA 95128 |
| 7W263 | Huber - Suhner Ltd | Tumbleinstrass 20 Pfaffikon, Switz CH-8330 |
| 70364 | American Electric Switch Corp | Route 4 Rocky Hill Hwy Lancaster, SC 29720 |
| 70903 | Belden Corp | 200 South Batavia Ave Geneva,IL 60134 |
| 71218 | Bud Industries | 4605 E 355th St Willoughby, OH 44094 |
| 71450 | CTS Corp | 905 North West Blvd Elkhart, IN 46514 |
| 71468 | ITT Cannon Electric | 10550 Talbert Ave Fountain Valley, CA 92708 |
| 71785 | TRW Inc | 1501 Morse Ave Elk Grove Village, IL 60104 |
| 72259 | Nytronics Inc | 475 Park Ave South New York, NY 10016 |
| 72982 | Murata Erie North America Inc | 645 West 11th St Erie, PA 16512 |
| 73138 | Beckman Industrial | 2500 Harbor Ave Fullerton, CA 92634 |
| 74840 | Illinois Capacitor Inc | 3757 W. Touhy Ave Lincoln, IL 60645 |
| 74970 | Johnson E F Co | 299 10th Ave South West Waseca, MN 56093 |
| 75263 | Keystone Carbon Co | 1935 State St St Marys, PA 15857 |

| CAGE | NAME | ADDRESS |
|---|---|---|
| 75332 | Kings Electronics Co Inc | Brooklyn, NY (relocated; see CAGE 91836) |
| 75378 | CTS Knights Inc | 400 Reimann Ave Sandwich, IL 60548 |
| 75915 | Tracor Littlefuse Inc | 800 East Northwest Hwy Des Plains, IL 60016 |
| 78553 | Eaton Corp | 8700 Brookpark Rd Cleveland, OH 44101 |
| 79963 | Zierick Mfg Co | Radio Circle Mt Kisko, NY 10549 |
| 8B649 | Intel Corp | 3065 Bowers Ave Santa Clara, CA 95051 |
| 8E631 | Solitron-MIC | Port Salerno, FL (relocated; see CAGE 95077) |
| 8G639 | Wavecom | Sunnyvale, CA 94086 |
| 8K805 | Omni Spectra Inc | Los Altos, CA |
| 8Z313 | LMS Electronics | 34101 Monroe Rd Charlotte, NC 28205 |
| 81073 | Grayhill Inc | 561 Hillgrove Ave La Grange, IL 60525 |
| 81312 | Winchester Electronics | 400 Park Rd Watertown, CT 06795 |
| 81349 | 'Military specification promulgated by military departments/agencies under authority of Defense Standardization Manual 4120 3-M.' | |
| 81703 | Mulberry Metal Products Inc | 2199 Stanley Terrace Union, NJ 07083 |
| 81774 | Carol Wire and Cable Corp | 249 Roosevelt Ave Pawtucket, RI 02860 |
| 82152 | Transco Products Inc | 4241 Glenco Ave Marina Del Ray, CA 90295 |
| 82199 | Polarad Electronics Inc | 5 Delaware Drv Lake Success, NY 11042 |
| 82877 | Rotron Inc | 7 Hasbrouck Lane Woodstock, NY 12498 |
| 83330 | Kulka Smith Inc | 1913 Atlantic Ave Manasquan, NJ 08736 |
| 84084 | American Iron and Machine Work | 720 Industrial Blvd Oklahoma City, OK |
| 86797 | Rogan Corp | 3455 Woodhead Dr Northbrook, IL 60062 |
| 88245 | Winchester Electronics | 13536 Saticoy St Van Nuys, CA 91409 |
| 89110 | Amp Inc | 1595 South Mt Joy St Elizabethtown, PA 17022 |
| 9W826 | EZ Form Cable Corp | 315 Peck St Bldg 24 New Haven, CT 06513 |
| 90201 | Mallory Capacitor Co | 4760 Kentucky Ave Indianaplolis, IN 46206 |
| 91303 | KOL Inc | St Paul, MN |
| 91506 | Augat Inc | 33 Sperry Ave Attleboro, MA 02703 |
| 91637 | Dale Electronics Inc | 2064 12th Ave Columbus, NE 68601 |
| 91662 | Elco Corp | Industrial Park Huntington, PA 16652 |
| 91833 | Keystone Electronics Corp | 31-07 20th Rd Astoria, NY 11105 |
| 91836 | Kings Electronics Co Inc | 40 Marbledale Road Tuckahoe, NY 10707 |
| 92194 | Alpha Wire Corp | 711 Lidgerwood Ave Elizabeth, NJ 07207 |
| 93459 | Weinschel Engineering Co | 1 Weinschel Lane Gaithersburg, MD 20877 |
| 94696 | Magnecraft | 1910 Techny Rd Northbrook, IL 60062 |

| CODE | NAME | Address |
|---|---|---|
| 95054 | Sermax Corp | Milwaukee, WI |
| 95077 | Solitron Devices Inc | 1177 Blue Heron Blvd Bldg 2<br>Riviera Beach, FL 33404 |
| 95146 | Alco Electronics Products Inc | 1551 Osgood St North Andover, MA 01845 |
| 95275 | Vitramon Inc | Box 544 Bridgeport CT 06601 |
| 95348 | Gordos Corp | 250 Glenwood Ave Bloomfield, NJ 07003 |
| 95987 | Weskesser Co Inc | 727 West Glendale Ave Milwaukee, WI 53209 |
| 96341 | Microwave Associates Inc | N.W. Industrial Park S. Ave<br>Burlington, MA 01803 |
| 96733 | San Fernando Electric Mfg Co | 1501 First St San Fernando, CA 91341 |
| 96906 | 'Military standards promulgated by military departments under authority of defense standardization manual 4120 3-M.' | |
| 98291 | Sealectro Corp 06611 | 40 Lindeman Dr Trumbull, CT |
| 99800 | American Precision Industries | 270 Quaker Rd East Aurura, NY 14052 |
| 99899 | Narda Microwave/Loral Corp | 435 Moreland Rd Hauppage, NY 11788 |

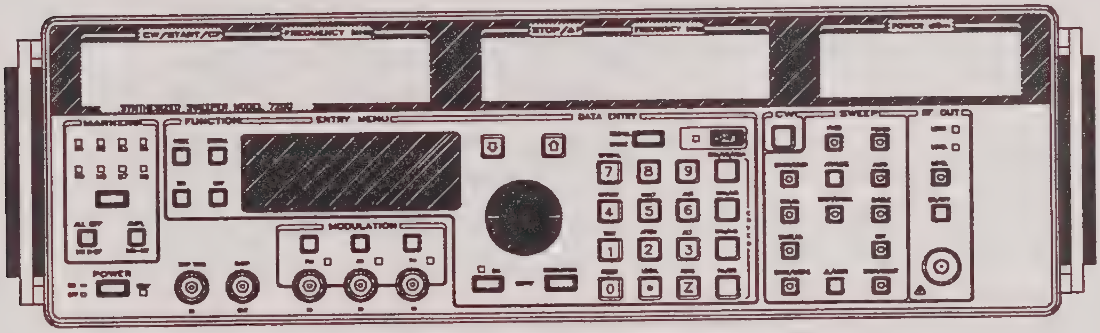
**ARBITRARY CODES (assigned by Giga-tronics)**

| CODE | NAME | Address |
|---|---|---|
| I000E | Intergrated Power | |
| M0006 | 3M Products | |
| P0009 | Princeton Case | |

Giga-tronics

# OPERATION & MAINTENANCE MANUAL

# MODEL 7200
## Synthesized Microwave Sweeper


CW/START/CF
FREQUENCY
STOP/Δ
FREQUENCY
POWER
SYNTHESIZED SWEEPER MODEL 7200
MARKERS
FUNCTION
ENTRY MENU
DATA ENTRY
CW
SWEEP
RF OUT
MODULATION
POWER
7
8
9
4
5
6
1
2
3
0
•
Z

## Volume 2 of 2

**Manual Part Number: 120AM00300**
**Print Date: August, 1993**

**Serial Numbers**

The instrument has a 6-digit serial number, which appears on a sticker on the rear panel. This manual applies to all serial numbers listed in Manual Changes (Chapter 10).

Printed in U.S.A.

GIGA-TRONICS, INC. ✧ 2495 ESTAND WAY ✧ P.O. BOX 232015 ✧ PLEASANT HILL,
CALIFORNIA 94523-6015 ✧ PHONE (510) 680-8160 ✧ FAX (510) 680-7736

## WARRANTY

Giga-tronics Model 7200 instruments are warranted against defective materials and workmanship for three years from date of shipment. Giga-tronics will at its option repair or replace products that are proven defective during the warranty period.

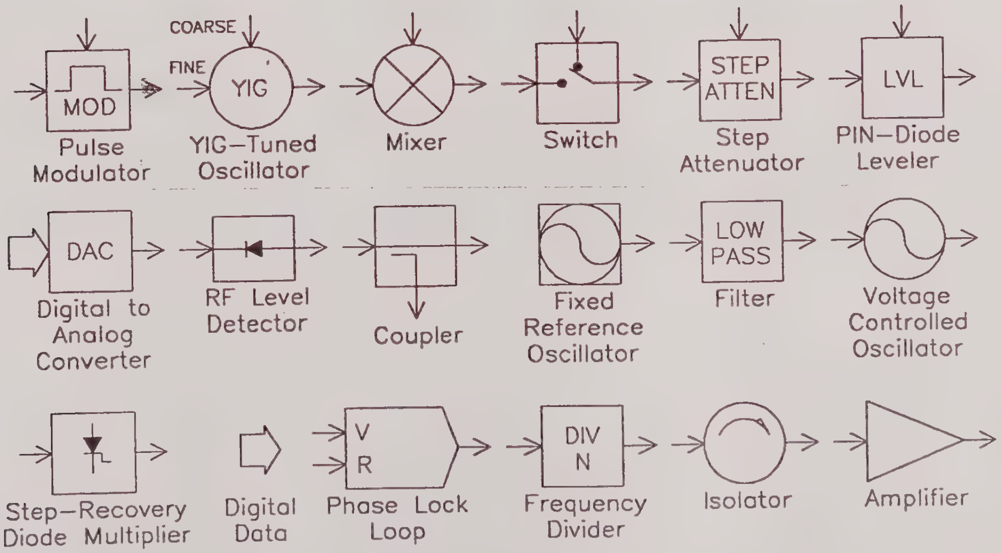
This warranty DOES NOT cover damage resulting from improper use, nor workmanship other than Giga-tronics service.

There is no implied warranty of fitness for a particular purpose, nor is Giga-tronics liable for any consequential damages.

Specification and price change privileges are reserved by Giga-tronics.

## SYMBOLS

Block diagram symbols frequently used in the manual are illustrated below.


MOD
Pulse Modulator
COARSE
FINE
YIG
YIG–Tuned Oscillator
Mixer
Switch
STEP ATTEN
Step Attenuator
LVL
PIN–Diode Leveler
DAC
Digital to Analog Converter
RF Level Detector
Coupler
Fixed Reference Oscillator
LOW PASS
Filter
Voltage Controlled Oscillator
Step–Recovery Diode Multiplier
Digital Data
V
R
Phase Lock Loop
DIV
N
Frequency Divider
Isolator
Amplifier

# *Model 7200, Configuration 330*

## OVERVIEW

Configuration 330 is a Model 7200 microwave synthesizer covering the 0.01 GHz to 20.00 GHz frequency range and furnished with the features and options discussed below. The instrument is furnished with integral internal and external amplitude modulation (AM), frequency modulation (FM), phase modulation (ΦM), and pulse modulation (PM) capability.

## OPTIONS & ACCESSORIES

Configuration 330 is furnished with Option 16, 1 Hz resolution.

## SPECIAL FEATURES

This configuration is furnished with the special features listed below.

## PHASE MODULATION, ΦM

Phase modulation capability is provided by replacing the standard A18 Output PLL (120BA07200) with a FM/ΦM Output PLL (420BA15910). The output from this PLL modulates the FM coil of the instrument's output YIG oscillator.

## FM1/ΦM1

FM1/ΦM1 is provided by installing the A13 Narrow Quiet FM/ΦM PLL (420BA22700) between the output of the A15 1 Hz PLL (120BA08800) and the input of the A16 Reference/Downconverter PLL (120BA07000). The output of the latter PLL modulates the reference YIG oscillator. System software controls the attenuation of the modulating signal to maintain proper deviation scaling.

## FM2/ΦM2

FM2/ΦM2 is provided by installing the A18 FM/ΦM Output PLL (420BA15910).

## SPECIFICATIONS

Instrument specifications are significantly affected by configuration 330. Additions and/or changes to published specifications for the instrument are presented on the following pages.

> **Note: Narrow Band FM is now called FM1; Wide Band FM is now called FM2. Narrow band ΦM is now called ΦM1; Wide Band ΦM is now called ΦM2.**

# ADDITIONS & CHANGES TO STANDARD PUBLISHED SPECIFICATIONS

## CW OPERATION

| | |
|---|---|
| Resolution: | 1 Hz, Option 16 |

## SPECTRAL PURITY

***Line/Fan Spurious & SSB Phase Noise, dBc/Hz (FM1, FM2, ΦM1, ΦM2)***

| Frequency Range, GHz | Power Line, Fan Related (Offset from carrier, Hz): | | | Single Sideband Phase Noise, dBc/Hz (Offset from carrier, Hz: | | | | |
|---|---|---|---|---|---|---|---|---|
| | <300 | 300 - 1K | >1K | 30 | 100 | 1K | 10K | 100K |
| 0.01 - <2 | -40 | -45 | -55 | -60 | -75 | -75 | -75 | -100 |
| ≥2 - <8 | -40 | -45 | -55 | -65 | -75 | -75 | -80 | -100 |
| ≥8 - 20 | -40 | -45 | -55 | -60 | -65 | -75 | -75 | -100 |

***Residual FM (Hz RMS, typical)***

| Frequency Range, GHz | CW Loop, post detection bandwidth, Hz | | FM1, FM2, ΦM1, ΦM2 post detection bandwidth, Hz | |
|---|---|---|---|---|
| | 50 - 3K | 50-15K | 50-3K | 50-15K |
| 0.01 - <2 | 30 | 200 | 60 | 400 |
| ≥2 - <8 | 20 | 150 | 40 | 300 |
| ≥8 - 20 | 30 | 200 | 60 | 400 |

## FREQUENCY AND PHASE MODULATION

Specifications apply for internal and external modulation with AM and PM off. Internal and/or external FM1 or FM 2 (or ΦM1 or ΦM2) may be operated simultaneously with AM or PM. FM1 and FM2 are mutually exclusive. FM and ΦM are mutually exclusive. BPSK is available in external FM mode only.

### Internal FM/ΦM Basic Characteristics

| | |
|---|---|
| Waveform: | Sine, square or triangle wave |
| FM Deviation Readout: | 3 digits, 0 to 1.00 MHz |
| Deviation Resolution: | 250 Hz |
| Accuracy: | ±10% typical |

### External FM/ΦM Basic Characteristics

| | |
|---|---|
| Waveform: | Any waveform compatible with bandwidth considerations |
| Connector: | EXT FM/ΦM, BNC, front and rear panel |
| Input Impedance: | 50 ohms, AC coupled |

| | |
|---|---|
| Sensitivity | |
| Frequency Modulation: | 1 MHz per volt, Peak, nominal |
| Phase Modulation: | 10 radians per volt, Peak, nominal |

## Other Specifications

| | |
|---|---|
| Incidental AM: | ≤5% |
| FM Distortion: | ≤10%, 2.5% typical |

## FM1 Characteristics

| | |
|---|---|
| Modulation rate: | 280 Hz to 10 kHz |
| Peak deviation: | ±100 × FMOD or 200 kHz (400 kHz typical), whichever is less |
| Deviation resolution: | ±250 Hz |
| Modulation flatness | |
| 280 Hz ≤ Fmod < 10 kHz: | ± 2.0 dB, ±1 dB typical |

## FM2 Characteristics

| | |
|---|---|
| Modulation rate: | 10 kHz to 1 MHz |
| Peak deviation: | 100 × Fmod, 1 MHz maximum |
| Deviation resolution: | ±250 Hz |
| Modulation flatness | |
| 10 kHz ≤ Fmod ≤ 1 MHz: | ±2.0 dB, ±1.0 dB typical |

## ΦM1 Characteristics

| | |
|---|---|
| Modulation rate: | 280 Hz to 10 kHz |
| Maximum deviation | |
| 280 ≤ Fmod ≤ 10 kHz: | 10 radians |
| Modulation resolution: | 0.001 radian |
| Modulation flatness | |
| 280 ≤ Fmod ≤ 10 kHz: | ±2.0 dB, ±1.0 dB typical |

## ΦM2 Characteristics

| | |
|---|---|
| Modulation rate: | 10 kHz to 100 kHz |
| Maximum deviation | |
| 10 kHz ≤ Fmod ≤ 100 kHz: | 10 radians |
| Deviation resolution: | 0.001 radians |
| Modulation Flatness | |
| 10 kHz ≤ Fmod < 100 kHz: | ±2.0 dB, ±1.0 dB typical |

### Bi-phase-shift keying (BPSK)

| | |
|---|---|
| Input signal: | Bi-phase modulated sub-carrier |
| Phase shift bandwidth: | 250 BPS to 10 kBPS, using FM/ΦM1 mode<br>10 kBPS to 48 kBPS typical, using FM/ΦM2 mode |

## OPERATION

### Phase Modulation (ΦM)

Phase modulation is measured in radians and is defined as the ratio of the FM deviation to the frequency of the modulating signal. This relationship may be expressed mathematically by the formula

$\Phi M = \Delta F \div F_{mod}$

where $\Delta F$ is peak deviation, $F_{mod}$ is the modulation frequency, and ΦM is the phase modulation index in radians.

For example, a peak deviation of 10 kHz with a modulating signal of 10 kHz has a modulation index of 1 radian; if the modulating signal were 20 kHz, however, the modulation index would be 0.5 radian.

Because ΦM is a form of FM, the constraints set on phase modulation are related with those set on frequency modulation. The maximum allowable modulation index is limited both by the maximum modulation rate and the maximum frequency deviation available.

The unit does not allow the user to set internal ΦM parameters beyond their allowable limits. For example, setting a modulation index of 1 radian at a 10 kHz rate would result in 10 kHz deviation. If the rate were then changed to 100 kHz the deviation would automatically be altered to 100 kHz to maintain the 1 radian modulation index. If, however, the user were to set one of the three ΦM parameters to a point where either of the other parameters were to exceed allowable limits, the unit would set the remaining parameter to a value that would be the maximum attainable value for that parameter. For example, if the modulation were set to 10 radians at a 20 kHz rate, the deviation would be 200 kHz. If the rate were then set to 1 MHz, 10 radians would require a 20 MHz deviation, which exceeds the specified maximum deviation. The computer would allow the 1 MHz rate but would decrease the deviation to 1 MHz (the maximum), resulting in a 1 radian modulation index.

Because the performance of the instrument typically exceeds specification, the instrument will accept input commands resulting in operation beyond the unit's specified operating range. Proper operation under such conditions is not guaranteed.

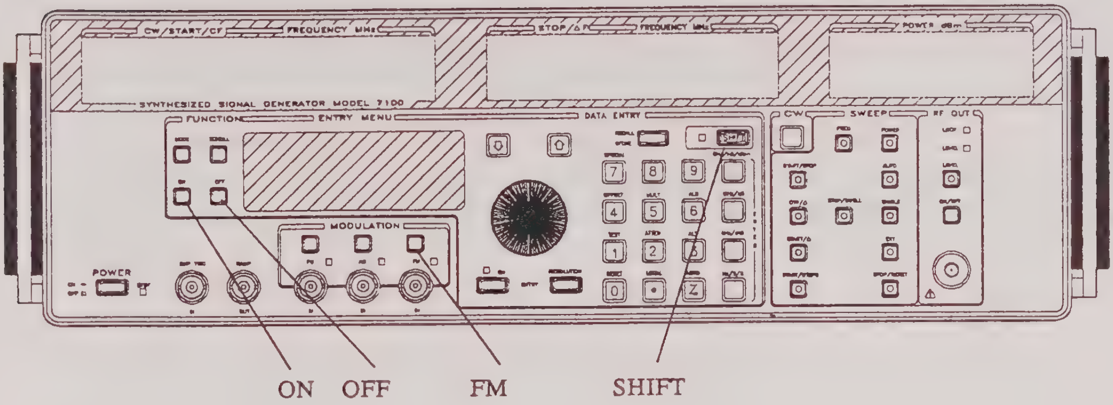

CW/START/CF
FREQUENCY MHz
STOP/ΔF
FREQUENCY MHz
POWER dBm
SYNTHESIZED SIGNAL GENERATOR MODEL 7100
FUNCTION
ENTRY MENU
DATA ENTRY
CW
SWEEP
RF OUT
MODULATION
POWER
SHIFT
7
8
9
4
5
6
1
2
3
0
.
ON
OFF
FM
SHIFT

*Figure 9.1: Front panel operation*

## FM and ΦM Mode Nomenclature

FM1 or ΦM1 is enabled by pressing the [FM] Button. "FM2" or "ΦM2" is displayed when [SHIFT] [FM] buttons are pressed. The user may switch between the two types of FM by pressing [SHIFT] [FM]. Once a mode has been selected, modulation may be turned on or off (via the [ON] and [OFF] keys) without affecting the choice of modulation. The ΦM mode is selected by pressing [SHIFT] [7] [60] [ENTER], where [ENTER] is any of the frequency terminator keys (Hz, kHz, MHz, or GHz). The ΦM mode may then be enabled or disabled via the [ON] and [OFF] keys. Disabling ΦM returns the unit to the FM mode.

## Front-Panel FM Control

Modulation rate and deviation are controlled as described in the manual. As with external FM, the deviation range is 0 Hz to 1 MHz with 250 Hz minimum increments.

## Front-Panel ΦM Control

Modulation rate and modulation index are controlled in the same manner as for internal FM. The modulation index is set in radians. As with external ΦM, the deviation range is 0 to 10 radians with 0.001 radian increments.

Pressing [FM] [ON] or [FM] [OFF] turns ΦM1 or ΦM2 on or off as appropriate.

## Application of External FM and ΦM Inputs

The input signal for both FM and ΦM is applied to the FM input connector, located on the instrument's front. The normal input signal is 1V peak (2V peak to peak). Maximum input, beyond which damage may occur, is ±5V, peak.

## FM Input Sensitivity

For external FM, the nominal sensitivity is 1 MHz per volt, peak. Thus, a 1V peak input would produce a deviation of 1 MHz peak. The front-panel FM deviation display has a range of 250 Hz to 1 MHz with 250 Hz minimum increments. The external FM signal is attenuated by an internal attenuator. The internal attenuator is calibrated for a maximum 1 Volt peak input signal. Therefore, the display reads correctly when the FM input signal is 1 Volt peak.

## ΦM Input Sensitivity

For external ΦM, the nominal sensitivity is 10 radians per volt, peak. Thus, a 1V peak input would produce a deviation of 10 radians peak. The user must set the input amplitude for the desired modulation index.

## GPIB Control of FM

Specific FM mode-control commands are listed below. Deviation and rate commands are as described in the manual (see page 2-26 ff). Internal modulation (sine, square, triangle) is available only when Option 24 is installed. System software limits deviation and rate as appropriate.

NOTE: The "NM" command means "NEXT MODULATION". This command scrolls the modulation from FM1 to FM2 and back. ***FM1 is the default modulation upon reset.*** For simplicity the same IEEE commands are used for both FM1 and FM2.

| ***FM1*** | ***FM2*** | ***Modulation Function Selected*** |
|---|---|---|
| NM | NM | Scrolls between FM1 and FM2 |
| FD d t | FD d t | FM deviation |
| FM0 | FM0 | FM off |
| FM1 | FM1 | FM external on |
| FM2 | FM2 | FM internal on (sine) |
| FM3 | FM3 | FM internal on (square) |
| FM4 | FM4 | FM internal on (triangle) |
| FR d t | FR d t | FM internal rate of modulation |

## GPIB Control of ΦM

GPIB operation is subject the same constraints as is manual operation. In general, phase modulation is programmed similarly to frequency modulation (see page 2-26 ff of the manual).

NOTE: The "NM" command means "NEXT MODULATION". This command scrolls the modulation from ΦM1 to ΦM2 and back. ***FM1 (not ΦM1) is the default modulation upon reset.*** For simplicity the same IEEE commands are used for both ΦM1 and ΦM2.

| ***ΦM1*** | ***ΦM2*** | ***Modulation Function Selected*** |
|---|---|---|
| NM | NM | Scrolls between ΦM1 and ΦM2 |
| PHM0 | PHM0 | ΦM off |
| PHM1 | PHM1 | ΦM external on |
| PHM2 | PHM2 | ΦMFM internal on (sine) |
| PHM3 | PHM3 | ΦMFM internal on (square) |
| PHM4 | PHM4 | ΦMFM internal on (triangle) |
| PHR d t | PHR d t | Sets modulation rate |
| RD d t | RD d t | Sets radians |

In ΦM, modulation rates are set via the command prefix *PHR*. For example, a 25 kHz modulation rate would be programmed when the command *PHRz25zKZ* was sent. The modulation index is set via the command prefix *RD*, which requires a terminator suffix *R*. For example, a 1.5 radian modulation index would be programmed when the command *RDz1.5z R* was sent.

## CALIBRATION

The calibration procedure below replaces the FM-related calibration procedures described in the manual. Other instrument calibration procedures are the same as for the standard instrument.

### 1. Required Test Equipment

- Stanford Research DS345 synthesized function generator, called audio sweeper below for brevity.
- HP 8902A measuring receiver.
- Downconverter Test Fixture (includes 0.01 to 20 GHz LO source, mixer, amplifier, and divide-by-40 circuit).
- FM Test Fixture (includes power splitter, mixer, two unequal-length coaxial lines).
- HP 70000 spectrum analyzer, called analyzer below for brevity.
- Oscilloscope, called scope below for brevity.

### 2. PLL Balance Pot Adjustment (A18)

a. Set the UUT to 4.500 GHz (nominal). Set the UUT output level to 0 dBm, all modulation off.

b. Connect the UUT RF output to the analyzer input. Tune the analyzer to the UUT frequency and set the analyzer span to 5 MHz (500 kHz/div).

c. Observe the level of the 1 MHz sidebands on the analyzer. Adjust A18-R16 [BALANCE] for minimum sideband level (this should be below -65 dBc).

### 3. FM2 Driver Amplifier Gain Selection (A18)

a. Connect the UUT RF output to the analyzer input.

b. Set the UUT for external FM2, maximum (1 MHz) deviation, and apply a 1 V Peak, 50 kHz signal, to the external FM input.

c. Band 1 (2-8 GHz) Gain Set.

(1) Set the UUT to 4.500 GHz (nominal). Tune the analyzer to the UUT frequency. Set analyzer span to 5 MHz, resolution bandwidth to 1 MHz.

(2) Adjust A18-R64 [FM1 pot] for 0.50V pp at A18-TP1 (the pot should be nearly fully counter-clockwise). If necessary, select a value for A18-R69.

(3) Verify the UUT produces between 1.0 and 1.6 MHz peak deviation. If necessary, select a value for A18-R46.

d. Band 2 (8-20 GHz) Gain Set.

(1) Set the UUT to 14.500 GHz (nominal). Tune the analyzer to the UUT frequency. Set analyzer span to 5 MHz, resolution bandwidth to 1 MHz.

(2) Adjust A18-R65 [FM2 pot] for 0.50V pp at A18-TP1 (the pot should be nearly fully counter-clockwise). If necessary, select a value for A18-R69.

(3) Verify the UUT produces between 1.0 and 1.6 MHz peak deviation. Ideally, the deviation should be identical to that observed in Band 1. If necessary, select a value for A18-R50.

## 4. FM2 Flatness Checks (A18)

a. Set the UUT for external FM2 with maximum deviation.

b. Set the audio sweeper for linear sweep from 4.00 kHz to 1.05 MHz with a sweep rate of 10 to 30 Hz as convenient. Set its output to 1.00V peak.

c. Apply this signal to the UUT's external FM input. Adjust the scope for XY operation. Connect the audio sweeper's rear panel SWEEP output to the X input of the scope. Adjust the scope for a full-screen horizontal (Y) sweep.

d. Modulation Processing Circuits Flatness Check.

   (1) Connect the Y input of the scope to A18-TP2. Verify a swept signal derived from the audio sweeper.

   (2) Adjust the scope so that the maximum amplitude of the signal on its screen is 6 divisions peak to peak (120%).

   (3) Verify that the minimum amplitude of the signal displayed on the scope is 4.5 divsions peak to peak (90%). This corresponds to a flatness of 2 dB. If high-frequency response is not flat, select a new value for A18-R70.

e. Connect the UUT's RF output to the FM test fixture's input. Connect the test fixture's output to the scope. Set UUT RF output to +13 dBm.

f. Loop Bandwidth Check.

   (1) Set the UUT to a FM test fixture null frequency between 2.5 and 7.5 GHz (nominal).

   (2) Set the audio sweeper to sweep from 5.0 kHz to 50.0 kHz with a sweep rate of 10 to 30 Hz as convenient. Set its output to 1.00V peak.

   (3) Set the UUT for external FM2 with maximum deviation. Adjust the scope so that the maximum amplitude of the signal on its screen is 6 divisions peak to peak (120%).

   (4) Set the audio sweeper to 10.0 kHz fixed frequency and verify that the amplitude of the signal is not less than 3.8 divisions peak to peak (75.7%). This corresponds to a flatness of 4 dB. If necessary, select a new value for A18-R38.

g. Set the audio sweeper for linear sweep from 30.00 kHz to 1.05 MHz with a sweep rate of 10 to 30 Hz as convenient. Set its output to 1.00V peak.

h. Band 1 (2-8 GHz) Flatness Check.

   (1) Set the UUT to a FM test fixture null frequency between 2.5 and 7.5 GHz (nominal).

   (2) Set the UUT for external FM2 with maximum deviation. Adjust the scope so that the maximum amplitude of the signal on its screen is 6 divisions peak to peak (120%).

   (3) Verify that the minimum amplitude of the signal on the scope is not less than 3.8 divisions peak to peak (75.7%). This corresponds to a flatness of 4 dB. If necessary, select new values for A18-R44 and/or A18-C49.

i. Band 2 (8-20 GHz) Flatness Check.

   (1) Set the UUT to a FM test fixture null frequency between 8.5 and 19.5 GHz (nominal).

(2) Set the UUT for external FM2 with maximum deviation. Adjust the scope so that the maximum amplitude of the signal on its screen is 6 divisions peak to peak (120%).

(3) Verify that the minimum amplitude of the signal on the scope is not less than 3.8 divisions peak to peak (75.7%). This corresponds to a flatness of 4 dB. If necessary, select new values for A18-R48 and/or A18-C54.

## 5. FM1 and FM2 Deviation Calibration (A18, A13)

Connect the UUT RF output to the downconverter test fixture. Connect the divide-by-40 output of the downconverter to the RF input of the measuring receiver.

### FM1 Calibration

a. Set UUT for external FM1, 50 kHz deviation, and apply a 1.00 Vp, 1.00 kHz signal to its external FM input.

b. Band 1 FM1 Calibration.

(1) Set the UUT to 04.500 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 12.5 MHz IF.

(2) Set the measuring receiver for FM PP/2 mode with 300 Hz to 15 kHz filter ON.

(3) Carefully adjust A13-R2 [FM CAL] for 1.25 ±0.025 kHz deviation on the measuring receiver (50 ±1 kHz actual FM deviation). If necessary, select a new value for A13-R31. Note the exact deviation for use in §5c.

### FM2 Calibration

c. Set UUT for external FM2, 1 MHz deviation, and apply a 1.00V Peak 50 kHz signal to its external FM input.

d. Band 1 (2-8 GHz) Calibration.

(1) Set the UUT to 4.500 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 12.5 MHz IF.

(2) Set A18-R64 [FM1 pot] fully CW.

(3) Set the measuring receiver for FM PP/2 mode with all filters OFF.

(4) Carefully adjust A18-R64 [FM1 pot] CCW for 25.00 ±0.05 kHz deviation on the measuring receiver (1.00 ±0.002 MHz actual FM deviation).

(5) N-Compensation Check.

Set the UUT to 04.599 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Verify 25.00 ±0.50 kHz deviation on the measuring receiver (1.00 ±0.02 MHz actual FM deviation).

e. Band 2 (8-20 GHz) Calibration.

(1) Set the UUT to 14.500 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 12.5 MHz IF.

(2) Set A18-R65 [FM2 pot] fully CW.

(3) Set the measuring receiver for FM PP/2 mode with all filters OFF.

(4) Carefully adjust A18-R65 [FM2 pot] CCW for 25.00 ±0.50 kHz deviation on the measuring receiver (1.00 ±0.02 MHz actual FM deviation).

(5) N-Compensation Check
Set the UUT to 14.799 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Verify 25.00 ±0.50 kHz deviation on the measuring receiver (1.00 0.02 MHz actual FM deviation).

f. Band 0 (0-2 GHz) Check.

(1) Set the UUT to 01.500 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 12.5 MHz IF.

(2) Set the measuring receiver for FM PP/2 mode with all filters OFF.

(3) Verify 25.00 kHz ±0.50 deviation on the measuring receiver (1.00 ±0.02 MHz actual FM deviation).

## 6. ΦM Calibration (A18, A13)

### ΦM1 Calibration

**NOTE: It is extremely important that the measuring receiver detect the proper IF frequency of modulation.**

a. Set the UUT for external ΦM1. Set the UUT to 4.5 GHz (nominal). Set the downconverter's LO source to a frequency 300 MHz above or below the frequency of the UUT. Set the measuring receiver to FREQ mode and verify a 300 MHz IF. Turn the measuring receiver's 50 Hz and 15 kHz filters ON. Select FM PP/2 on the measuring receiver.

b. Set the audio sweeper for a 1 kHz output frequency with an amplitude of 1Vp. Adjust A13-R8 [ΦM CAL] for 10.0 ±0.5 kHz deviation. This is equivalent to 10 radians. If necessary, select a new value for A13-R35.

c. Set the audio sweeper to 2 kHz. Verify that the measuring receiver indicates 20.0 ±2.4 kHz deviation. This is equivalent to flatness of ±1.0 dB.

d. Set the audio sweeper to 5.0 kHz. Verify that the measuring receiver indicates 50.00 ±12.9 kHz deviation. This is equivalent to flatness of ±2.0 dB.

### ΦM2 Calibration

e. Set the UUT for external ΦM2 and connect the audio sweeper output to its FM/ΦM input.

f. Connect the UUT RF output to the downconverter test fixture. Connect the divide-by-1 output of the downconverter to the RF input of the measuring receiver.

g. Set the UUT to 04.500 GHz (nominal). Set the downconverter's LO source to a frequency 300 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 300 MHz IF.

h. Set the measuring receiver for FM PP/2 mode with all filters OFF.

i. Set the audio sweeper for a 10 kHz output frequency with an amplitude of 1.00Vp. Adjust A18-R77 [ΦMOD] for 100.0 ±28.5 kHz deviation. This is equivalent to 10 radians, ±2 dB. Verify this by using the ΦM mode on the measuring receiver. If necessary, select a new value for A18-R76.

j. Set the audio sweeper to 20 kHz. Verify that the measuring receiver indicates 200.0 ±24.4 kHz deviation. This is equivalent to flatness of ±1.0 dB. If response is too low, select a larger value for A18-C68. If response is too high, select a smaller value for A18-C68.

k. Set the audio sweeper to 40 kHz. Verify that the measuring receiver indicates 400.0 ±48.8 kHz deviation. This is equivalent to flatness of ±1 dB.

l. Repeat §6i through §k as necessary.

## PERFORMANCE TESTS

The performance test procedure below replaces the FM-related procedures described in the manual. Other instrument performance test procedures are the same as for the standard instrument. Percentages called out in the procedure are intended for use with an oscilloscope which has a ratio feature.

**NOTE: It is extremely important that the measuring receiver detect the proper IF frequency of modulation.**

### 1. Required Test Equipment

a. Stanford Research DS345 synthesized function generator, called audio sweeper below for brevity.

b. HP 8902A measuring receiver.

c. Downconverter Test Fixture (includes 0.01 to 20 GHz LO source, mixer, amplifier, and divide-by-40 circuit).

d. FM Test Fixture (includes power splitter, mixer, two unequal-length coaxial lines).

e. Oscilloscope, called scope below for brevity.

### 2. External FM1 and FM2 Flatness Checks.

### FM1

a. Connect the UUT's RF output to the FM test fixture's input. Connect the test fixture's output to the scope. Set UUT RF output to +13 dBm.

b. FM1 Band1 Checks.

(1) Set the UUT to a FM test fixture null frequency between 2.5 and 7.5 GHz (nominal).

(2) Set the audio sweeper to sweep from 280 Hz to 10.0 kHz with a sweep rate of 10 to 30 Hz as convenient. Set its output to 1.00 Vp.

(3) Set the UUT for external FM1 with deviation between 200 kHz and 400 kHz. Adjust the scope so that the maximum amplitude of the signal on its screen is 3 divisions peak to peak (60%).

(4) Set the audio sweeper to 1 kHz fixed frequency and verify that the amplitude of the signal is not less than 1.9 divisions (37.5%). This corresponds to a flatness of 4 dB.

c. FM 1 Band 2 Flatness Checks.

(1) Set the UUT to a FM test fixture null frequency between 8.5 and 19.5 GHz (nominal).

(2) Set the UUT for external FM1 with maximum deviation. Adjust the scope so that the maximum amplitude of the signal on its screen is 3 divisions peak to peak (60%).

(3) Verify that the minimum amplitude of the signal on the scope is not less than 1.9 divisions (37.5%). This corresponds to a flatness of 4 dB.

**FM2**

d. Connect the UUT's RF output to the FM test fixture's input. Connect the test fixture's output to the scope. Set UUT RF output to +13 dBm.

e. Set the audio sweeper for linear sweep from 10.00 kHz to 1.05 MHz with a sweep rate of 10 to 30 Hz as convenient. Set its output to 1.00V peak.

f. Band 0 (10 MHz - <2 GHz) Flatness Checks

   (1) Set the UUT to a FM test fixture null frequency between 1 GHz and <2 GHz (nominal).

   (2) Set the UUT for external FM2 with maximum deviation. Adjust the scope so that the maximum amplitude of the signal on its screen is 6 divisions peak to peak (120%).

   (3) Verify that the minimum amplitude of the signal on the scope is not less than 3.8 divisions peak to peak (75.7%). This corresponds to a flatness of 4 dB.

g. Band 1 (2-8 GHz) Flatness Checks

   (1) Set the UUT to a FM test fixture null frequency between 2.5 and 7.5 GHz (nominal).

   (2) Set the UUT for external FM2 with maximum deviation. Adjust the scope so that the maximum amplitude of the signal on its screen is 6 divisions peak to peak (120%) peak.

   (3) Verify that the minimum amplitude of the signal on the scope is not less than 3.8 divisions (75.7%). This corresponds to a flatness of 4 dB.

h. Band 2 (8-20 GHz) Flatness Checks

   (1) Set the UUT to a FM test fixture null frequency between 8.5 and 19.5 GHz (nominal).

   (2) Set the UUT for external FM2 with maximum deviation. Adjust the scope so that the maximum amplitude of the signal on its screen is 6 divisions peak to peak (120%) peak.

   (3) Verify that the minimum amplitude of the signal on the scope is not less than 3.8 divisions (75.7%). This corresponds to a flatness of 4 dB.

## 3. FM Deviation Calibration Checks

Connect the UUT RF output to the downconverter test fixture. Connect the divide-by-40 output of the downconverter to the RF input of the measuring receiver.

### FM1 Deviation Calibration Checks

a. Set UUT for external FM1, 100 kHz deviation, and apply a 1V Peak 4 kHz signal to its external FM input.

b. Band 1 FM1 Check.

   (1) Set the UUT to 4.500 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 12.5 MHz IF.

   (2) Set the measuring receiver for FM PP/2 mode with 300 Hz to 15 kHz filters ON.

   (3) Verify 2.50 ±0.647 kHz deviation on the measuring receiver (100 ±25.9 kHz actual FM deviation).

c. Band 2 FM1 Check.

   (1) Set the UUT to 14.500 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 12.5 MHz IF.

   (2) Set the measuring receiver for FM PP/2 mode with 300 Hz to 15 kHz filters ON.

   (3) Verify 2.50 ±0.647 kHz deviation on the measuring receiver (100 ±25.9 kHz actual FM deviation).

### FM2 Deviation Calibration Checks

d. Set UUT for external FM2, 1 MHz deviation, and apply a 1.00V Peak 50 kHz signal to its external FM input.

e. Band 1 (2-8 GHz) Calibration Check.

   (1) Set the UUT to 4.500 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 12.5 MHz IF.

   (2) Set the measuring receiver for FM PP/2 mode with all filters OFF.

   (3) Verify an FM deviation of 25.00 ±6.47 kHz on the measuring receiver (1.00 ±0.259 MHz actual deviation). Note the deviation.

   (4) N-Compensation Check.

   Set the UUT to 4.599 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Verify deviation found is the same as the deviation noted from §3e3, ±1.00 kHz, on the measuring receiver.

f. Band 2 (8-20 GHz) Calibration.

   (1) Set the UUT to 14.500 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 12.5 MHz IF.

   (2) Set the measuring receiver for FM PP/2 mode with all filters OFF.

   (3) Verify an FM deviation of 25.00 ±6.47 kHz on the measuring receiver (1.00 ±0.259 MHz actual deviation).

(4) N-Compensation Check.

Set the UUT to 14.799 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Verify deviation found is the same as deviation noted from §3f3, ±1.00 kHz, on the measuring receiver.

g. Band 0 (0-2 GHz) Check.

(1) Set the UUT to 01.500 GHz. Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 12.5 MHz IF.

(2) Set the measuring receiver for FM PP/2 mode with all filters OFF.

(3) Verify an FM deviation of 25.00 ±6.47 kHz on the measuring receiver (1.00 ±0.259 MHz actual deviation).

## 4. ΦM Calibration Check

### ΦM1 Calibration Check

a. Set the UUT for external ΦM 1.

b. Connect the UUT RF output to the downconverter test fixture. Connect the divide-by-1 output of the downconverter to the RF input of the measuring receiver.

c. Set the UUT to 4.500 GHz (nominal). Set the downconverter's LO source to a frequency 300 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 300 MHz IF.

d. Set the measuring receiver for FM PP/2 mode with appropriate filters ON.

e. Set the audio sweeper for a 1 kHz output frequency with an amplitude of 1Vp. Verify 10 ±2.6 kHz deviation. This is equivalent to 10 radians. Verify this on the measuring receiver using the ΦM function.

f. Set the audio sweeper to 5 kHz. Verify that the measuring receiver indicates 50 ±12.95 kHz deviation. This is equivalent to flatness of ±2.0 dB.

g. Set the audio sweeper to 10 kHz. Verify that the measuring receiver indicates 100.00 ±25.90 kHz deviation. This is equivalent to flatness of ±2.0 dB.

### ΦM2 Calibration Check

h. Set UUT for external ΦM2 and connect the audio sweeper output to its FM/ΦM input.

i. Connect the UUT RF output to the downconverter test fixture. Connect the divide-by-1 output of the downconverter to the RF input of the measuring receiver.

j. Set the UUT to 04.500 GHz (nominal). Set the downconverter's LO source to a frequency 300 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 300 MHz IF.

k. Set the measuring receiver for FM PP/2 mode with all filters OFF.

l. Set the audio sweeper for a 10 kHz output frequency with an amplitude of 1.00V Peak. Verify 100.0 ±25.8 kHz deviation. This is equivalent to a flatness of ±2 dB relative to 10 kHz.

m. Set the audio sweeper for a 20 kHz output frequency with an amplitude of 1.00V Peak. Verify that the measuring receiver indicates 200 ±51.8 kHz deviation. This is equivalent to a flatness of ±2 dB relative to 20 kHz.

n. Set the audio sweeper for a 40 kHz output frequency with an amplitude of 1.00Vp. Verify that the measuring receiver indicates 400.0 ±103.6 kHz deviation. This is equivalent to flatness of ±2 dB relative to 40 kHz.

o. Connect the divide-by-40 output of the downconverter to the RF input of the measuring receiver.

p. Set the UUT to 04.500 GHz (nominal). Set the downconverter's LO source to a frequency 500 MHz above (or below) the frequency of the UUT. Set the measuring receiver to Frequency mode and verify a 12.5 MHz IF.

q. Set the measuring receiver for FM PP/2 mode with all filters OFF.

r. Set the audio sweeper for a 50 kHz output frequency with an amplitude of 1V Peak. Verify that the measuring receiver indicates 12.5 kHz FM deviation (500 kHz actual FM deviation) ±3.3 kHz.

| ***Test Data Sheet, Configuration 330*** | | |
|---|---|---|
| **Type of Test** | **Test Procedure** | **Test Result [ ✓ ]** |
| External FM1 & FM2 Flatness | 2(b)(4) FM1 Band1 | |
| | 2(c)(3) FM 1 Band 2 | |
| | 2(f)(3) Band 0 (.01-2 GHz) | |
| | 2(g)(3) Band 1 (2-8 GHz) | |
| | 2(h)(3) Band 2 (8-20 GHz) | |
| FM1 & FM2 Deviation Calibration | 3(b)(3) Band 1 FM1 | |
| | 3(c)(3) Band 2 FM1 | |
| | 3(e)(3)Band 1 (2-8 GHz) | |
| | 3(e)(4) N-Compensation | |
| | 3(f)(3) Band 2 (8-20 GHz) | |
| | 3(f)(4) N-Compensation | |
| | 3(g)(3) Band 0 (0-2 GHz) | |
| ΦM1 & ΦM2 Calibration | 4(e) 10 ±2.6 kHz deviation | |
| | 4(f) 50.0 ±12.95 kHz deviation | |
| | 4(g) 100.0 ±25.90 kHz deviation | |
| | 4(l) 100.0 ±25.8 kHz deviation | |
| | 4(m) 200.0 ±51.8 kHz deviation | |
| | 4(n) 400.0 ±103.6 kHz deviation | |
| | 4(r) 12.5 kHz FM deviation (500 kHz actual FM deviation) | |

Parts List for 420BA15910 FM/OM O/P PLL C269, 270 Rev 2

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| 1 | 420BF15910 | 1 | 58900 | 420BF15910 | FM/OM O/P PLL M7XXX |
| 2 | ETST-06224 | 6 | 88245 | 1280B | TURRET TERMINAL |
| 3 | 420BS15910 | Ref | 58900 | 420BS15910 | FM/OM O/P PLL C269, 270 |
| C 1 | CC50-00330 | 1 | 52763 | EDPT-33-NPO-5% | 33 PF CERAMIC NPO |
| C 2 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 3 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 4 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 5 | CE25-R6470 | 1 | 16508 | ECEA1EU470 | 47 UF 25V RADIAL LEAD |
| C 6 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 7 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 8 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 9 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 12 | CC50-05100 | 1 | 56289 | 2C2525U105M050B | 1 UF CERAMIC Z5U |
| C 13 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 14 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 15 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 16 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 17 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 18 | CC50-03220 | 1 | 51642 | 150-100-W5R-223K | .022 UF CERAMIC X7R |
| C 19 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 20 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 21 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 22 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 23 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 24 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 25 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 26 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 27 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 28 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 29 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 30 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 31 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 32 | CC50-04100 | 1 | 56289 | 1C20Z5U104M050B | .1 UF CERAMIC Z5U |
| C 33 | CC50-00100 | 1 | 51642 | 100-100-COG-100J | 10 PF CERAMIC NPO |
| C 34 | CC50-00100 | 1 | 51642 | 100-100-COG-100J | 10 PF CERAMIC NPO |
| C 35 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 36 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 37 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 38 | CC50-00180 | 1 | 51642 | 150-100-COG-180J | 18 PF CERAMIC NPO |
| C 39 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 40 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 41 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 42 | CC50-02100 | 1 | 52763 | EDPT-1000-Y5P10% | .001 UF CERAMIC Y5P |
| C 43 | CC50-01330 | 1 | 51642 | 150-100-COG-331J | 330 PF CERAMIC NPO |
| C 44 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 45 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 46 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 47 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 48 | CC50-03100 | 1 | 51642 | 150-100-W5R-103K | .01 UF CERAMIC X7R |
| C 49 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 51 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 52 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |
| C 54 | CC50-01220 | 1 | 51642 | 150-100-COG-221 | 220 PF CERAMIC NPO |
| C 56 | CC50-03470 | 1 | 51642 | 150-100-W5R-473 | .047 UF CERAMIC X7R |

Parts List for 420BA15910 FM/OM O/P PLL C269, 270 Rev 2

| Item | Part Number | Qty | CAGE | Mfr's Part Number | Description |
|---|---|---|---|---|---|
| R 14 | RN50-16810 | 1 | 81349 | RN50D6811F | 6.81 K OHMS 1% MET FILM |
| R 15 | RN50-34990 | 1 | 65940 | CRB20FX4993 | 499K;M F;1/5W;1%;100PPM |
| R 16 | RAPG-21000 | 1 | 32997 | 3296Z-1-103 | 10K 10% 25T .5W TRIM POT |
| R 17 | RN50-14990 | 1 | 65940 | CRB20FX4991 | 4.99K;M F;1/5W;1%;100PPM |
| R 18 | RN50-13920 | 1 | 81349 | RN50D3921F | 3.92 K OHMS 1% MET FILM |
| R 19 | RN50-16810 | 1 | 81349 | RN50D6811F | 6.81 K OHMS 1% MET FILM |
| R 20 | RN50-21270 | 1 | 81349 | RN50D1272F | 12.7K OHMS 1% MET FILM |
| R 21 | RN50-21270 | 1 | 81349 | RN50D1272F | 12.7K OHMS 1% MET FILM |
| R 22 | RN50-19530 | 1 | 81349 | RN50D9531F | 9.53K OHMS 1% MET FILM |
| R 23 | RN50-19530 | 1 | 81349 | RN50D9531F | 9.53K OHMS 1% MET FILM |
| R 24 | RN50-21270 | 1 | 81349 | RN50D1272F | 12.7K OHMS 1% MET FILM |
| R 25 | RN50-19530 | 1 | 81349 | RN50D9531F | 9.53K OHMS 1% MET FILM |
| R 26 | RN50-16190 | 1 | 81349 | RN50D6191F | 6.19 K OHMS 1% MET FILM |
| R 27 | RN50-26980 | 1 | 65940 | CRB20FX6982 | 69.8K;M F;1/5W;1%;100PPM |
| R 28 | RN50-26980 | 1 | 65940 | CRB20FX6982 | 69.8K;M F;1/5W;1%;100PPM |
| R 29 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 30 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 31 | RN50-31000 | 1 | 65940 | CRB20FX1003 | 100K;M F;1/5W;1%;100PPM |
| R 33 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 34 | RN50-01000 | 1 | 65940 | CRB20FX1000 | 100;M F;1/5W;1%;100PPM |
| R 35 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 36 | RN50-11500 | 1 | 81349 | RN50D1501F | 1.50 K OHMS 1% MET FILM |
| R 37 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 38 | RN50-15620 | 1 | 81349 | RN50D5621F | 5.62 K OHMS 1% MET FILM |
| R 39 | RN50-00511 | 1 | 65940 | CRB20FX51R1 | 51.1;M F;1/5W;1%;100PPM |
| R 40 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 41 | RN50-00100 | 1 | 65940 | CRB20FX10R0 | 10.0;M F;1/5W;1%;100PPM |
| R 42 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 43 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 44 | RN50-11210 | 1 | 81349 | RN50D1211F | 1.21 K OHMS 1% MET FILM |
| R 45 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 46 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 47 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 48 | RN50-03920 | 1 | 81349 | RN50D3920 | 392 OHMS 1% METAL FILM |
| R 49 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 50 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 51 | RN50-21000 | 1 | 65940 | CRB20FX1002 | 10.0 K OHMS 1% MET FILM |
| R 52 | RN50-11210 | 1 | 81349 | RN50D1211F | 1.21 K OHMS 1% MET FILM |
| R 53 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 54 | RN50-11000 | 1 | 81349 | RN50D1001F | 1.00 K OHMS 1% MET FILM |
| R 55 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 56 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 57 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 58 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 59 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 60 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 61 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 62 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 63 | RN55-01820 | 1 | 81349 | RN55C1820F | 182 OHMS 1% MET FILM |
| R 64 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 65 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 66 | RAPG-12000 | 1 | 32997 | 3296Z-1-202 | 2K 10% 25T .5W POT. |
| R 67 | RN50-12000 | 1 | 65940 | CRB20FX2001 | 2.00K;M F;1/5W;1%;100PPM |
| R 68 | RN50-24990 | 1 | 65940 | CRB20FX4992 | 49.9K;M F;1/5W;1%;100PPM |

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